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ABSTRACT

This report contains data on funds and manpower in research and development and provides a summary picture of the national patterns of research and development funding and manpower allocations attributed to the four sectors of the economy: Federal Government, industry, universities and colleges, and other nonprofit institutions. Highlights indicate: (1) Total R&D spending in the U.S. is estimated to reach $30.1 billion in 1973-3% above the 1972 level of $29.2 billion. (2) Research and development is expected to account for 2.4% of the GNP in 1973. (3) In 1973 the Federal Government will support 53% of the U.S. R&D effort. (4) Almost 40% of R&D spending in the U.S is devoted to research. (5) Nearly three-fifths of the Nation's basic research will be performed by universities and colleges in 1973. (6) An estimated 525,000 R&D scientists and engineers were employed in the United States in 1972-1% fewer than in 1971. (7) If recent trends in R&D costs per worker continue, and R&D spending reaches a level of about $35 billion, approximately 650,000 scientists and engineers will be employed in R&D work by 1980. (Author/MJM)

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NATIONAL PATTERNS OF R&D RESOUR

Funds & Manpower in the United States 19

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Funds & Manpower in the United States 1953-1973

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NATIONAL SCIENCE FOUNDATION

news

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FOR RELEASE:
June 19, 1973
NSF 73-160

U.S. R&D SPENDING TO TOP $30 BILLION FOR 1973

Research and development spending in the United States is estimated at $30.1 billion for 1973 -- a rise of three percent over 1972 -- according to a report released today by the National Science Foundation (NSF).

Research and development are expected to account for 2.4 percent of the nation's gross national product in 1973, down from 2.5 percent in 1972 and from 3.0 percent in 1964.

These and other data on funds and manpower in research and development are contained in the report, National Patterns of R&D Resources, 1953-1973 -- Funds and Manpower in the United States (NSF 73-303). The report covers R&D performance and funding by all sectors of the economy -- Federal Government, industrial firms, universities and colleges, and philanthropic and other nonprofit organizations.

-more-

Expenditures for research and development cover a wide range of activities -- from the quest for new knowledge and understanding embodied in research, to the systematic use of scientific knowledge for the production of products and processes, which is involved in development. Basic research, which is expected to account for 15 percent of the nation's R&D effort during 1973, is emphasized by universities and colleges. Industrial firms perform 84 percent of the development work.

Concerning manpower, the report said an estimated 525,000 scientists and engineers were employed in research and development in 1972, one percent less than in 1971. Nearly 70 percent of these R&D professionals worked for industrial firms.

Non-Federal R&D funding is expected to continue to show significant growth. For the three-year period 1970-1973 the increase was 20 percent. Federal support of research and development is estimated at $16 billion for 1973, nearly one percent above the 1972 figure.

National Patterns of R&D Resources, 1953-73 -- Funds and Manpower in the United States, was prepared by the Foundation's Division of Science Resources Studies, and is part of NSF's continuing surveys on science and technology. Copies of the report are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $.80 domestic postpaid; $.55 at the GPO Bookstore.

-END-

NATIONAL PATTERNS OF

R&D RESOURCES

Funds & Manpower in the United States 1953-1973

National Science Foundation—NSF 73-303

FOREWORD

This report provides a summary picture of the national patterns of R&D funding and manpower allocations attributed to the four sectors of the economy—Federal Government, industry, universities and colleges, and other nonprofit institutions. Time series data on R&D funds, cover the period from 1953-73; manpower data begin with 1954.

R&D funding data used are obtained from various NSF surveys, generally conducted on an annual or biennial basis. The reports on these individual studies contain greater detail on the specific sector covered. For information concerning these and related manpower reports, note the items identified on the inside cover of this publication.

This report was prepared in the Foundation's Division of Science Resources Studies, Thomas J. Mills, Director, under the general guidance of William L. Stewart, Head, R&D Economic Studies Section.

H. Guyford Stever
Director
National Science Foundation

February 1973

acknowledgments

This report was prepared under the supervision of Thomas J. Hogan, Study Director, Industry Studies Group. The analysis of the data and the writing of the report were performed by Rita K. Bricksin, Helene Ebenfield, Robert O. Santos, and John R. Chirichiello. Norman Seltzer, Study Director, and Morris Cobern, Manpower Utilization Studies Group, was responsible for the analysis and statistical materials for the manpower section.

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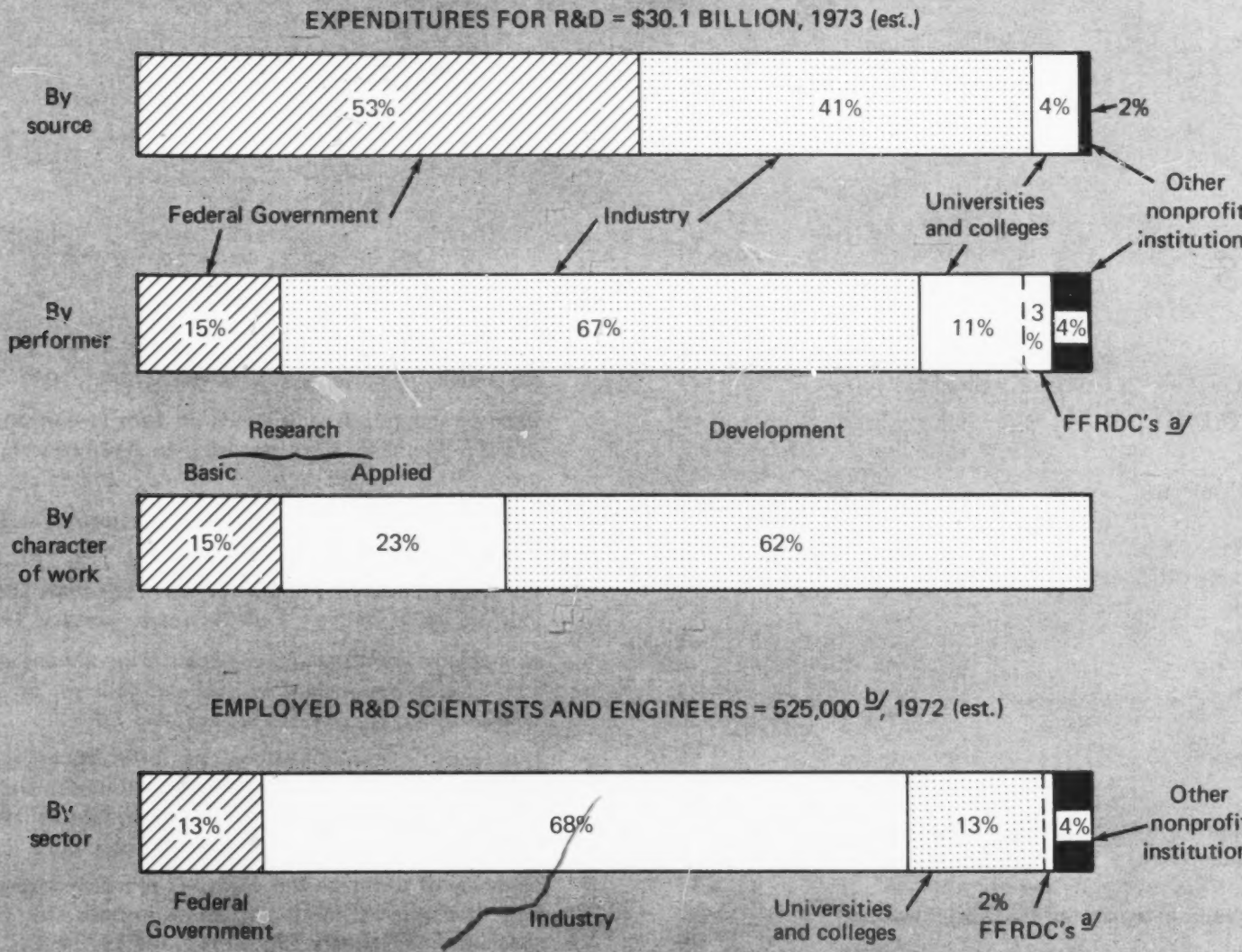
The national R&D effort



a/ Federal Funded Research and Development Centers administered by universities and colleges.

b/ Full-time equivalents.

Source: National Science Foundation

HIGHLIGHTS

- Total R&D spending in the United States is estimated to reach $30.1 billion in 1973—3 percent above the 1972 level of $29.2 billion.
- Research and development is expected to account for 2.4 percent of the Nation's gross national product (GNP) in 1973. This ratio is down from 2.5 percent in 1972 and a high of 3.0 percent in 1964.
- In 1973 the Federal Government will support 53 percent of the U.S. R&D effort. About 70 percent of this support is for defense and space programs.
- Almost 40 percent of R&D spending in the United States is devoted to research. In 1973 basic research expenditures are estimated at $4.5 billion and applied research at $6.8 billion. Development spending is estimated at $18.8 billion for 1973.
- Nearly three-fifths of the Nati universities and colleges in 19 both applied research and devel
- An estimated 525,000 R&D s the United States in 1972—1 percent of these people were en
- If recent trends in R&D costs reaches a level of about $35 bil engineers will be employed in R

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penditures are estimated at $4.5 billion
. Development spending is estimated at

- Nearly three-fifths of the Nation's basic research will be performed by universities and colleges in 1973. Industry is the leading performer of both applied research and development.

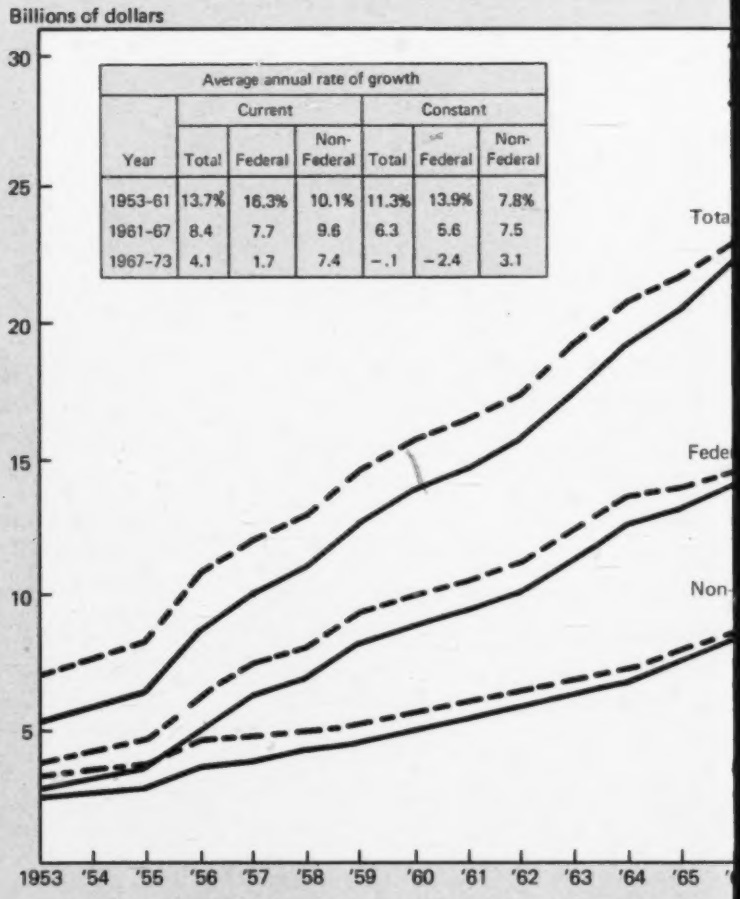
- An estimated 525,000 R&D scientists and engineers were employed in the United States in 1972—1 percent fewer than in 1971. Nearly 70 percent of these people were employed in industry.

- If recent trends in R&D costs per worker continue, and R&D spending reaches a level of about $35 billion, approximately 650,000 scientists and engineers will be employed in R&D work by 1980.

R&D FUNDING PATTERNS

R&D spending within the United States has continued its pattern of overall growth in recent years. In 1973 total U.S. R&D expenditures are expected to reach a level of $30.1 billion—3 percent above the 1972 amount and nearly 75 percent more than was spent on these activities a decade earlier. In constant dollars, there is no change expected between 1972 and 1973. Federal Government spending on R&D activities remained relatively stable at $14 billion to $15 billion between 1966–71, due to decreased emphasis on defense and space research and development. Since 1971, however, R&D activities have begun to increase, primarily in the areas of defense and health. Federal R&D programs are expected to be funded at a level of nearly $16.0 billion in 1973.

R&D funding trends, 1953-



Average annual rate of growth						
	Current			Constant		
Year	Total	Federal	Non-Federal	Total	Federal	Non-Federal
1953-61	13.7%	16.3%	10.1%	11.3%	13.9%	7.8%
1961-67	8.4	7.7	9.6	6.3	5.6	7.5
1967-73	4.1	1.7	7.4	−.1	−2.4	3.1

Source: National Science Foundation

ATTERNS

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R&D funding trends, 1953-73

Billions of dollars

Year	Average annual rate of growth					
	Current			Constant		
	Total	Federal	Non-Federal	Total	Federal	Non-Federal
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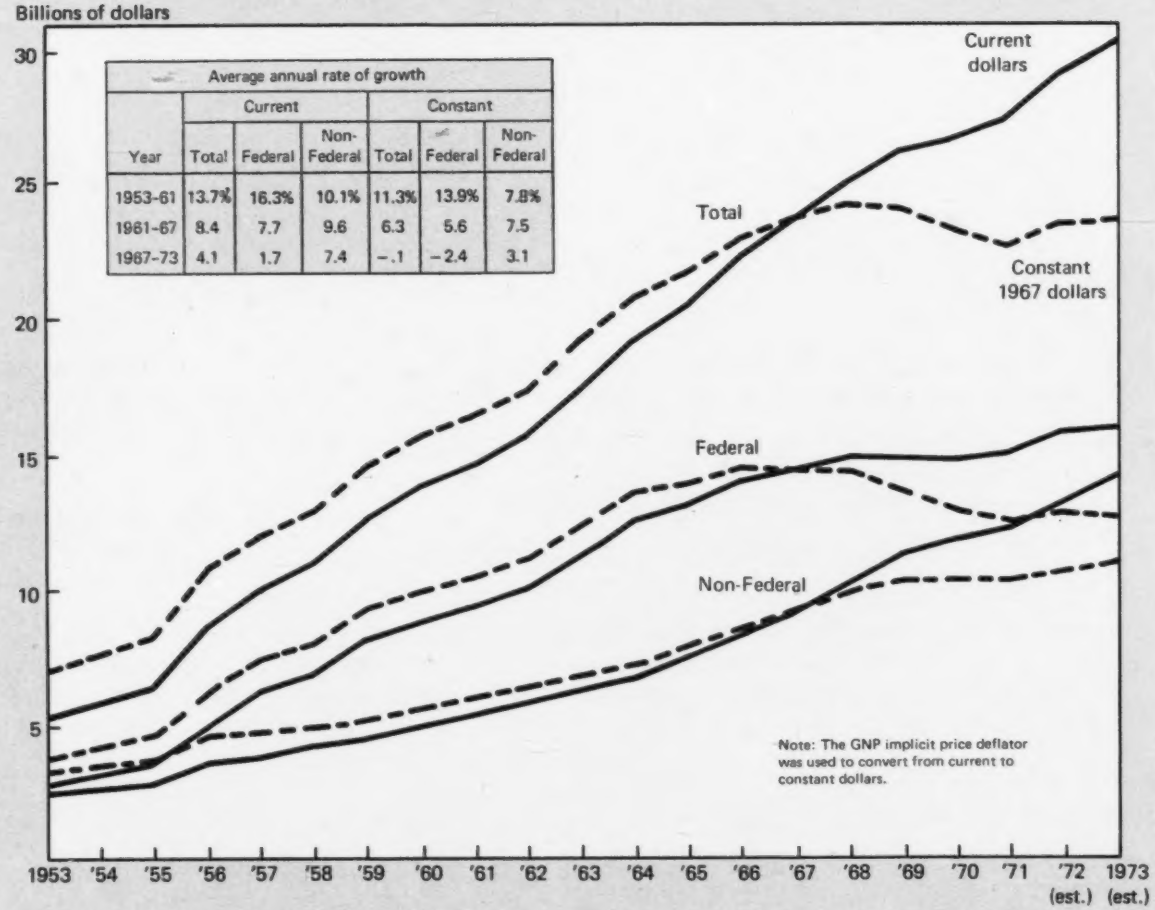
1967-73	4.1	1.7	7.4	−.1	−2.4	3.1


30
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Current dollars
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Non-Federal
Note: The GNP implicit price deflator was used to convert from current to constant dollars.
1953 '54 '55 '56 '57 '58 '59 '60 '61 '62 '63 '64 '65 '66 '67 '68 '69 '70 '71 '72 (est.) 1973 (est.)

Source: National Science Foundation

R&D Comparisons

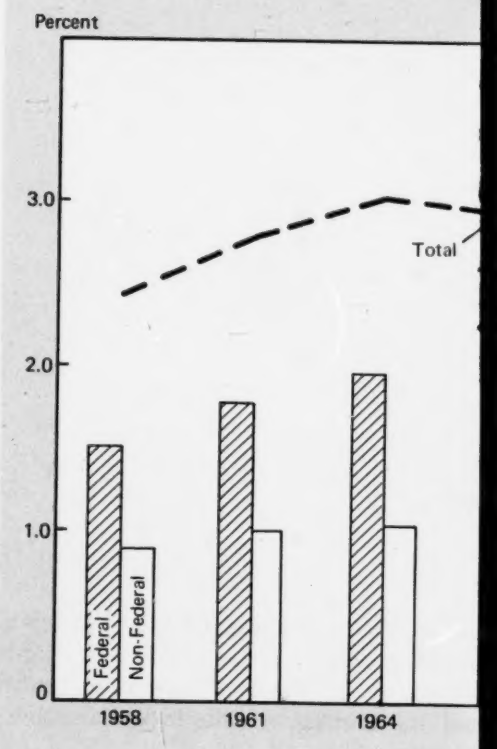
- The relationship of R&D expenditures to the gross national product (GNP) affords a comparison, over time, of the relative importance of these R&D activities in the economy.

- In 1973 research and development is expected to amount to 2.4 percent of the Nation's GNP, down from 2.5 percent in 1972 and 3.0 percent in 1967. This ratio is not expected to increase during the rest of this decade over its 1972–73 level.

- As shown in table 1, the United States devoted a larger percent of its GNP to R&D activities in 1971 than did other major R&D-performing countries for which data are available. However, in recent years, countries such as Germany and Japan have been registering sharp increases in their R&D/GNP ratios.

- Between 1967–71 total R&D expenditures increased by 16 percent in the United States. Each of the other major R&D-performing countries registered larger gains, with the largest being in Japan and Germany—nearly 150 percent and 90 percent, respectively.

Research and development/gross



Source: National Science Foundation

Table 1. R&D spending patterns of sele

Country	R&D/GNP 1967
United States	3.0%
France	2.2
United Kingdom	2.3
Japan	1.4
Germany	1.7

SOURCES: National Science Foundation and Organizat
Development.

o the gross national product (GNP)
relative importance of these R&D

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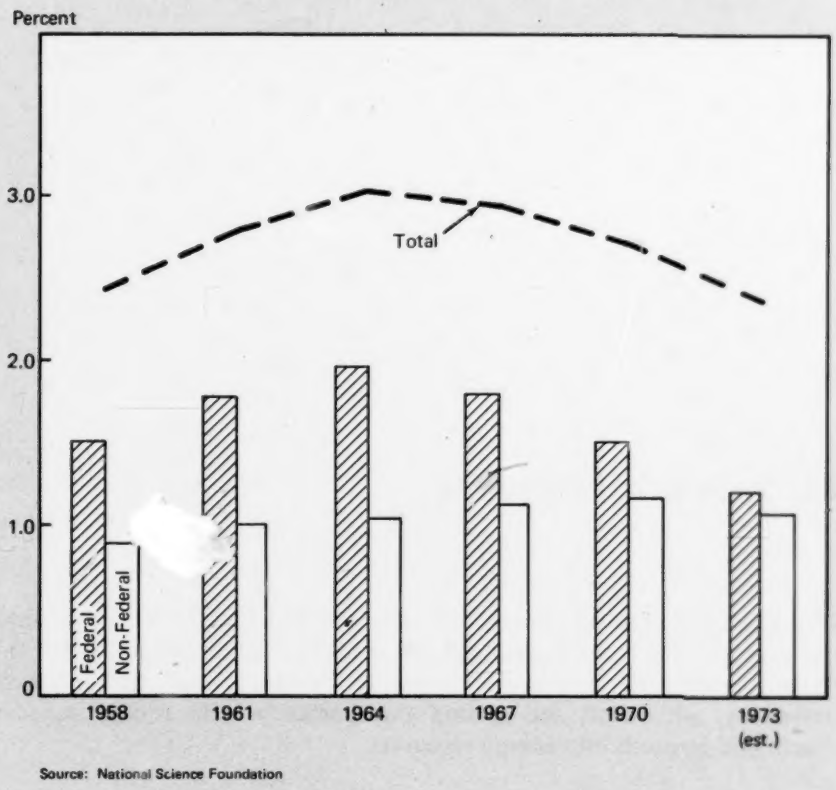
Research and development/gross national product 1958-73



Source: National Science Foundation

Table 1. R&D spending patterns of selected countries, 1967–71

Country	R&D/GNP		Relative growth in R&D expenditures	
	1967	1971	1967	1971
United States	3.0%	2.6%	100	116
France	2.2	1.8	100	127
United Kingdom	2.3	2.1	100	121
Japan	1.4	1.8	100	247
Germany	1.7	2.0	100	189

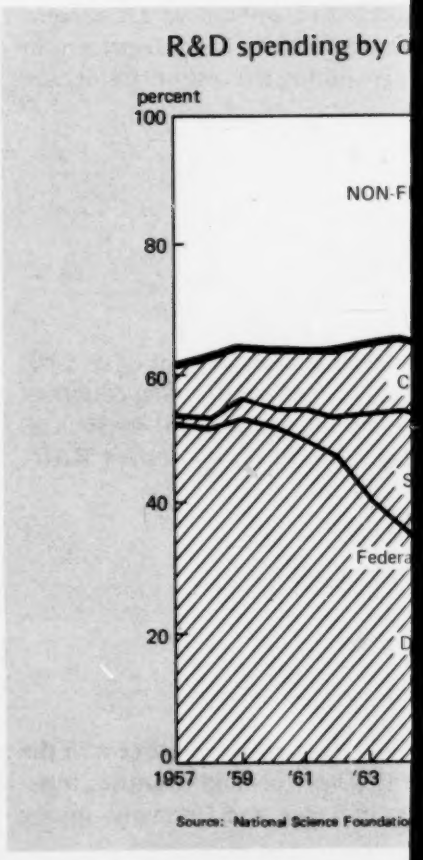
SOURCES: National Science Foundation and Organization for Economic Co-operation and Development.

R&D By Selected Objective

- The increased emphasis on civilian priorities of Federal R&D programs is reflected in the continuous, though gradual, increases recorded in this series. Among the programs in this area are the development of health resources, air, water, and ground transportation, educational improvement, and research into energy resources.

- Defense- and space-related programs dominated R&D activities from 1957 to 1966, during which time they claimed over one-half of all funds devoted to research and development. The shift in emphasis from these programs is reflected in their declining share of funds, which are expected to reach a low of 38 percent (about $11 billion) in 1973.

- Non-Federal programs will account for slightly less than one-half of the Nation's R&D performance in 1973. The largest contributor is the industrial sector, with $12.4 billion, followed by universities and colleges, $1.3 billion, and other nonprofit institutions, providing about $430 million.



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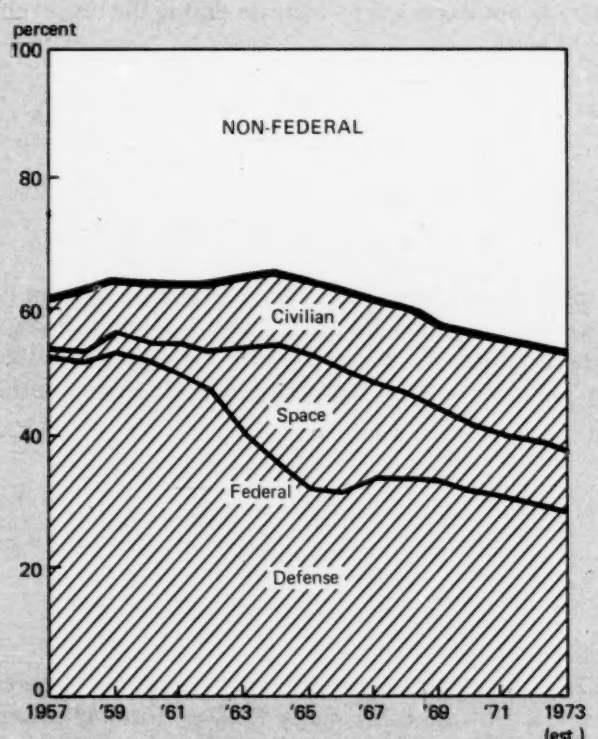
R&D spending by objective, 1957-73



Source: National Science Foundation

R&D Projections

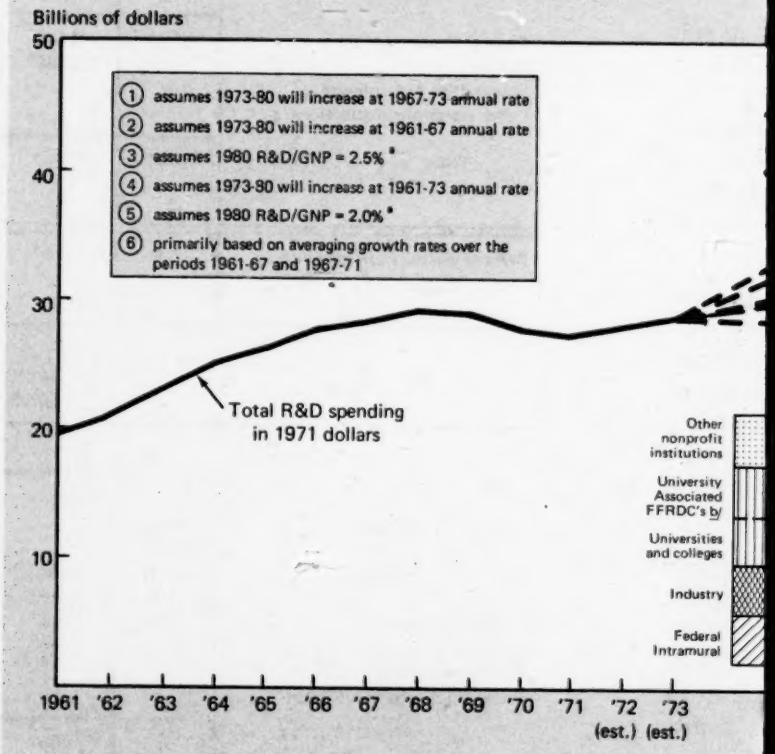
- R&D spending can be projected to 1980 by using several alternative sets of assumptions. The projections made in this report for 1980 are based primarily on past trends and are not predictions of R&D activity.

- The Nation's GNP, expressed in 1971 dollars, is projected at $1.62 trillion in 1980. This is based on estimates made by the Bureau of Labor Statistics. If the R&D/GNP ratio were to remain at the 1971–73 average of 2.5 percent, R&D spending in 1980, in 1971 dollars, would amount to 40.5 billion. If the ratio were to decrease to 2.0 percent, R&D spending in 1980 would be 32.4 billion.

- If R&D spending were to increase over the 1973–80 period at annual rates equal to those of earlier years (1961–67, 1961–73, and 1967–73), the U.S. R&D effort in 1971 dollars would range between $28.2 billion and $43.5 billion in 1980.

- Total R&D spending in 1980, expressed in 1971 dollars, can also be shown by performing sector. The R&D effort for each sector was projected to 1980 by assuming that the 1973–80 period would increase equal to the unweighted average growth primarily over the periods 1960–66 and 1966–71. The application of this approach results in a 1980 R&D effort of $34.2 billion.

1980 R&D projections


Billions of dollars
50
40
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20
10
① assumes 1973-80 will increase at 1967-73 annual rate
② assumes 1973-80 will increase at 1961-67 annual rate
③ assumes 1980 R&D/GNP = 2.5% a/
④ assumes 1973-80 will increase at 1961-73 annual rate
⑤ assumes 1980 R&D/GNP = 2.0% a/
⑥ primarily based on averaging growth rates over the periods 1961-67 and 1967-71
Total R&D spending in 1971 dollars
Other nonprofit institutions
University Associated FFRDC's b/
Universities and colleges
Industry
Federal Intramural
1961 '62 '63 '64 '65 '66 '67 '68 '69 '70 '71 '72 (est.) '73 (est.)

a/ Based on 1980 GNP in 1971 dollars projected at $1.65 trillion.
b/ Federally Funded Research and Development Centers.

Source: National Science Foundation

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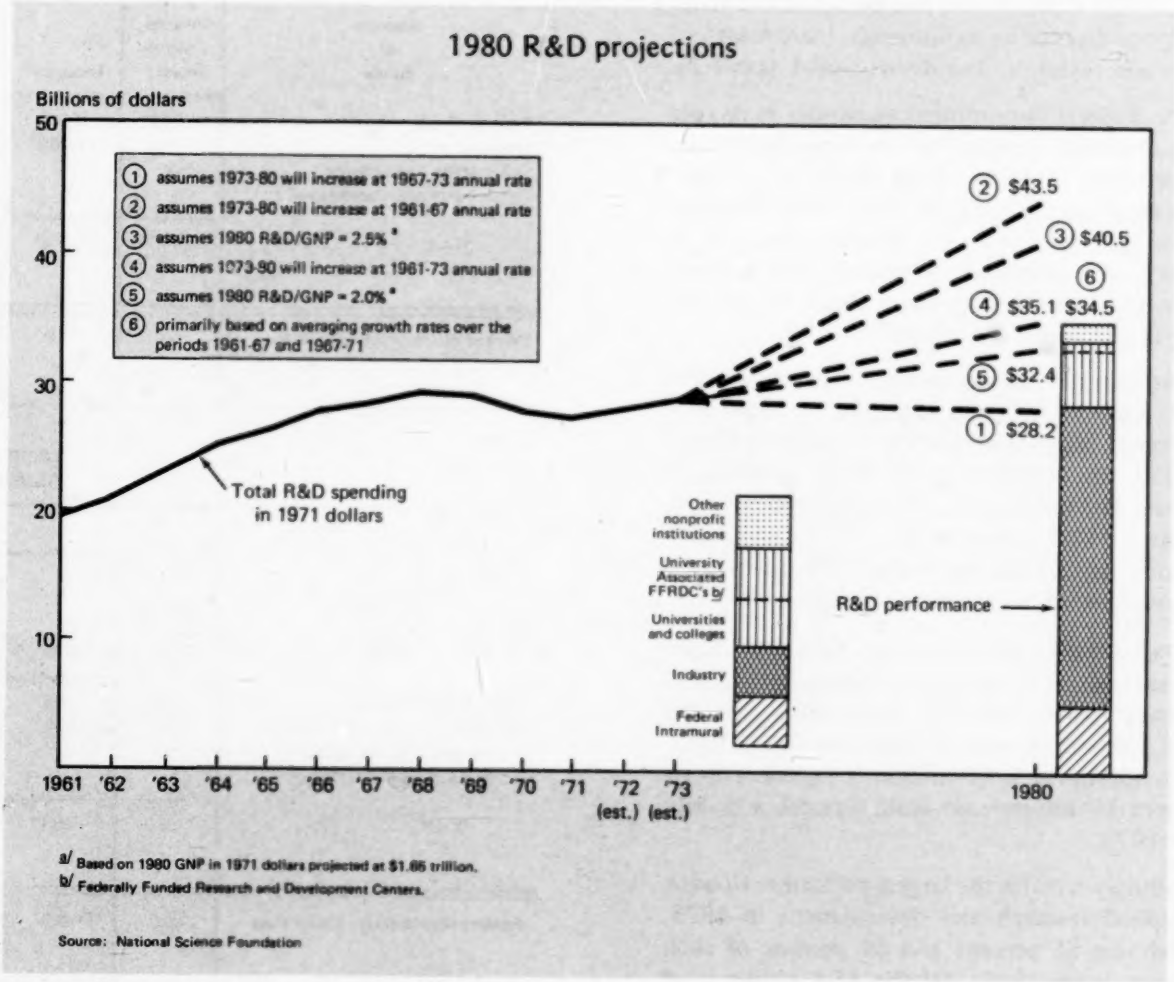
1980 R&D projections
Billions of dollars
50
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1 assumes 1973-80 will increase at 1967-73 annual rate
2 assumes 1973-80 will increase at 1961-67 annual rate
3 assumes 1980 R&D/GNP = 2.5%*
4 assumes 1973-80 will increase at 1961-73 annual rate
5 assumes 1980 R&D/GNP = 2.0%*
6 primarily based on averaging growth rates over the periods 1961-67 and 1967-71
2 $43.5
3 $40.5
6
4 $35.1
$34.5
5 $32.4
1 $28.2
Total R&D spending in 1971 dollars
Other nonprofit institutions
University Associated FFRDC's b/
Universities and colleges
Industry
Federal Intramural
R&D performance
1961 '62 '63 '64 '65 '66 '67 '68 '69 '70 '71 '72 (est.) '73 (est.)
1980
a/ Based on 1980 GNP in 1971 dollars projected at $1.65 trillion.
b/ Federally Funded Research and Development Centers.
Source: National Science Foundation

Transfers of Funds

- Transfer tables permit intersectoral comparisons of the distribution of R&D funds, by both source of funds and performers of R&D activities. Data can be compared for the R&D aggregate or for its components, basic research, applied research, and development (table 2).
- The Federal Government continues in its role as the leading supporter of research and development. Between 1967 and 1973, however, its share of the national R&D effort dropped from 61 percent to 53 percent. Industry, as the largest performer of research and development, is expected to claim about 51 percent of total Federal R&D funds in 1973.
- The industry sector, second in size in support of R&D activities, is expected to show a 7-percent increase in funding between 1972 and 1973. In contrast to the wide distribution given Federal monies, the industry sector will spend $12.2 billion of the $12.4 billion allocated by private enterprise to research and development in its own laboratories.
- Traditionally, the largest performer of basic research—universities and colleges—will expend almost three-fifths, or $2.6 billion, of the $4.5 billion devoted to such activities in 1973. An additional $700 million is expected to be spent by industry on basic research activities in 1973.
- Industry remains the largest performer of both applied research and development in 1973, claiming 55 percent and 84 percent of such funds, respectively. Of the $6.8 billion total allocated to applied research, industry will provide $2.8 billion, or 40 percent; of the $18.8 billion allocated to development, industry will provide $8.9 billion, or 47 percent.

Table 2. Intersectoral transfers of funds used for pe development, basic research, applied research, and dev

RESEARCH AND DEVELOPME
[Dollars in millions]

Sources of funds	Performers			
	Federal Government	Industry[b]	Universities and colleges[c]	A Fl
Federal Government	4,500	8,100	1,860	
Industry	–	12,200[e]	83	
Universities and colleges	–	–	1,290[e]	
Other nonprofit institutions	–	–	192	
Total	4,500	20,300	3,425	
			4,225	
Percent distribution, performers	15.0	67.4	11.3	
			14.0	

BASIC RESEARCH[a]
[Dollars in millions]

Sources of funds	Performers			
	Federal Government	Industry[b]	Universities and colleges[c]	As Fl
Federal Government	590	145	1,420	
Industry	–	560[e]	53	
Universities and colleges	–	–	1,013[e]	
Other nonprofit institutions	–	–	129	
Total	590	705	2,615	
			2,915	
Percent distribution, performers	13.2	15.7	58.4	
			65.1	

[a] All data are estimated from reports by performers.
[b] Expenditures for Federally Funded Research and Development Centers (FFRDC's) administered by both industry and by nonprofit institutions are included in the totals of their respective sectors. Fl financed requiremer training pu

Table 2. Intersectoral transfers of funds used for performance of research and development, basic research, applied research, and development, 1973 (estimated)

RESEARCH AND DEVELOPMENT[a]
[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[b]	Universities and colleges[c]	Associated FFRDC's[d]	Other nonprofit institutions[b]		
Federal Government	4,500	8,100	1,860	800	725	15,985	53.1
Industry	–	12,200[e]	83	–	110	12,393	41.2
Universities and colleges	–	–	1,290[e]	–	–	1,290	4.3
Other nonprofit institutions	–	–	192	–	240[e]	432	1.4
Total	4,500	20,300	3,425	800	1,075	30,100	
			4,225				
Percent distribution, performers	15.0	67.4	11.3	2.7	3.6		100.0
			14.0				

BASIC RESEARCH[a]
[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[b]	Universities and colleges[c]	Associated FFRDC's[d]	Other nonprofit institutions[b]		
Federal Government	590	145	1,420	300	145	2,600	58.0
Industry	–	560[e]	53	–	30	643	14.4
Universities and colleges	–	–	1,013[e]	–	–	1,013	22.6
Other nonprofit institutions	–	–	129	–	95[e]	224	5.0
Total	590	705	2,615	300	270	4,480	
			2,915				
Percent distribution, performers	13.2	15.7	58.4	6.7	6.0		100.0
			65.1				

[a] All data are estimated from reports by performers.
[b] Expenditures for Federally Funded Research and Development Centers (FFRDC's) administered by both industry and by nonprofit institutions are included in the totals of their respective sectors. FFRDC's are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and training purposes.

Table 2. Intersectoral transfers of funds used for performance of research and development, basic research, applied research, and development, 1972 (estimated)—Con.

APPLIED RESEARCH[a]
[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[b]	Universities and colleges[c]	Associated FFRDC's[d]	Other nonprofit institutions[b]		
Federal Government	1,660	1,050	330	240	350	3,630	53.1
Industry	–	2,730[e]	22	–	50	2,802	41.0
Universities and colleges	–	–	261[e]	–	–	261	3.8
Other nonprofit institutions	–	–	52	–	90[e]	142	2.1
Total	1,660	3,780	665	240	490	6,835	
			905				
Percent distribution, performers	24.3	55.3	9.7	3.5	7.2		100.0
			13.2				

DEVELOPMENT[a]
[Dollars in millions]

Sources of funds	Performers					Total	Percent distribution, sources
	Federal Government	Industry[b]	Universities and colleges[c]	Associated FFRDC's[d]	Other nonprofit institutions[b]		
Federal Government	2,250	6,905	110	260	230	9,755	51.9
Industry	–	8,910[e]	8	–	–	8,948	47.6
Universities and colleges	–	–	16[e]	–	–	16	.1
Other nonprofit institutions	–	–	11	–	55[e]	66	.4
Total	2,250	15,815	145	260	315	18,785	
			405				
Percent distribution, performers	12.0	84.2	.8	1.4	1.6		100.0
			2.2				

[b]Expenditures for Federally Funded Research and Development Centers (FFRDC's) administered by both industry and by nonprofit institutions are included in the totals of their respective sectors. FFRDC's are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and training purposes.

[c]Includes agricultural experiment stations.

[d]Federally Funded Research and Development Centers (FFRDC's) administered by individual universities and colleges and by university consortia.

[e]Includes State and local government funds.

Source: National Science Foundation.

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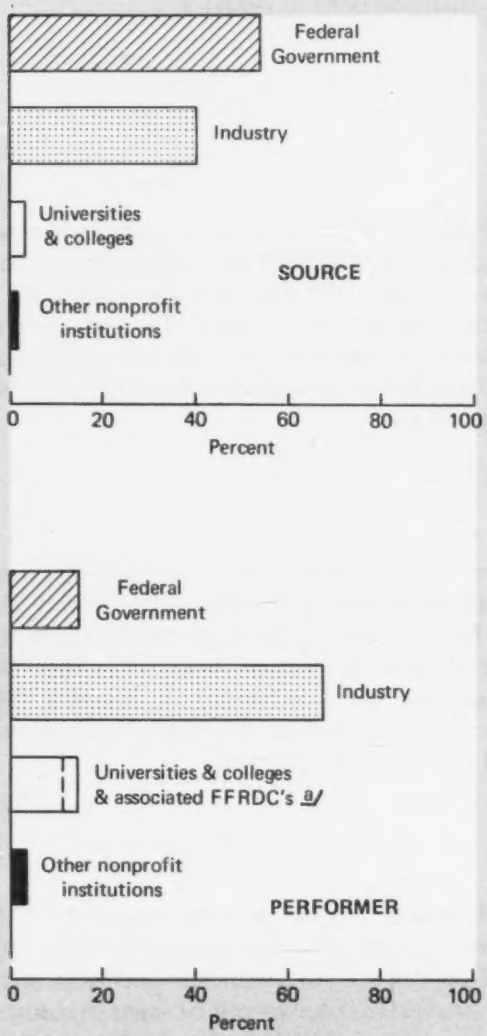
Source: National Science Foundation.

Sources and performers of research & development, 1973 (est.)



a/ Federally Funded Research and Development Centers administered by universities and colleges.

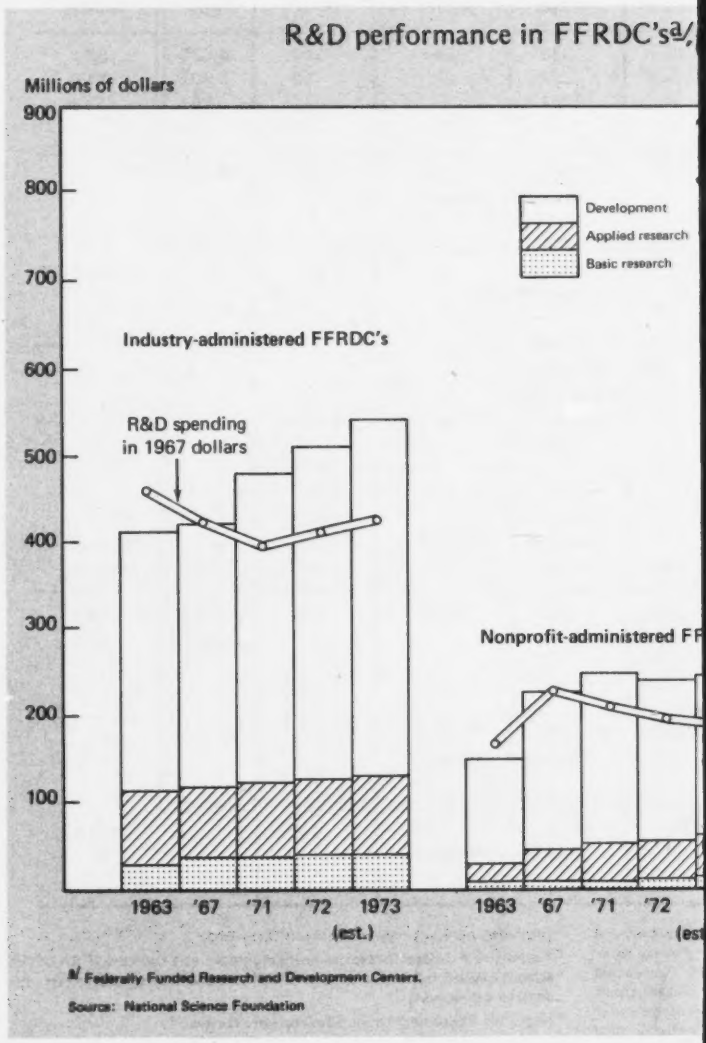
Source: National science foundation

Federally Funded Research and Development Centers

- Federally Funded Research and Development Centers (FFRDC's) are organizations which undertake R&D activities almost entirely for the Federal Government. They are administered by industrial concerns and nonprofit or educational institutions, generally on a nonprofit basis.

- In 1973 FFRDC's are expected to spend approximately $1.6 billion on R&D activities. This is 4 percent above the 1972 expenditure level and 20 percent more than the 1967 number. When expressed in constant 1967 dollars, the increase between 1972 and 1973 is estimated at 1 percent.

- University and college-administered FFRDC's are expected to spend one-half of these 1973 R&D dollars. An additional one-third of the available R&D dollars will be spent in industry-administered FFRDC's. The remaining 15 percent of the 1973 R&D dollars are expected to be spent in FFRDC's administered by nonprofit institutions.



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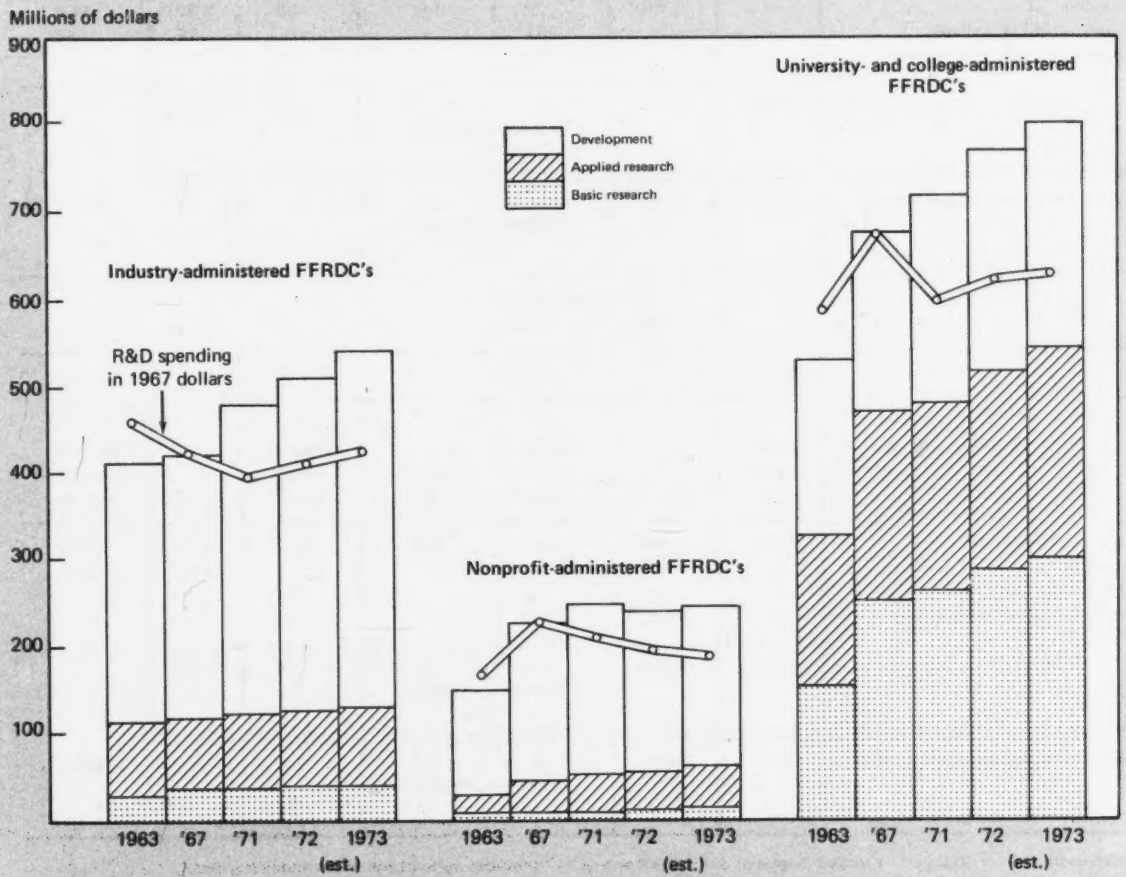
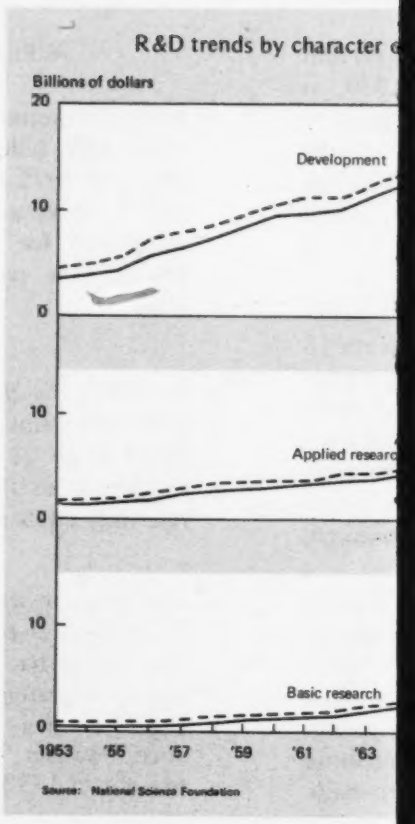


[a/] Federally Funded Research and Development Centers.

Source: National Science Foundation

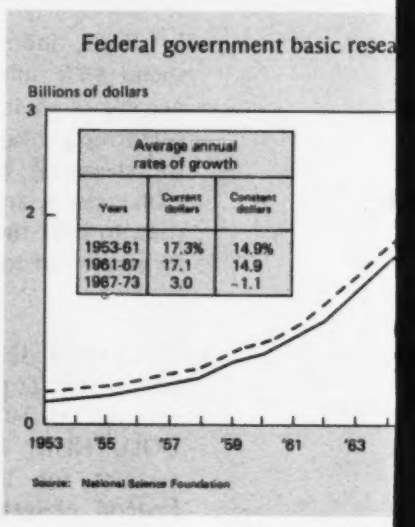
Character of Work

- In 1973, basic research accounted for 15 percent of total R&D spending; applied research amounted to an additional 23 percent; and development accounted for the remaining 62 percent. The corresponding ratios in 1953 were 9 percent, 25 percent, and 65 percent, respectively.



BASIC RESEARCH

- Total expenditures for basic research performance are anticipated to reach $4.5 billion in 1973—a gain of 4 percent over 1972. When measured in constant dollars, the expected gain is 1 percent. During the decade 1963–73, basic research expenditures registered a gain of over 100 percent in current dollars and nearly 50 percent in constant dollars.
- Universities and colleges are the primary performers of the Nation's basic research. They are expected to conduct 58 percent of the total basic research effort in 1973—about the same as in 1972. During the period 1953–73 universities and colleges increased their share of total basic research performance from 35 percent to 58 percent. There were corresponding decreases in Federal Government and industrial performance—21 percent to 13 percent, and 31 percent to 16 percent, respectively.
- In 1973, the Federal Government is expected to finance 58 percent of total basic research—almost the same share as in 1971 and 1972. Between 1972 and 1973, Federal Government support is expected to increase by 2 percent.
- Five Federal agencies—National Aeronautics and Space Administration (NASA), Department of Health, Education, and Welfare (HEW), National Science Foundation (NSF), Department of Defense (DOD), and the Atomic Energy Commission (AEC)—are expected to account for 88 percent of the total Federal obligations for basic research in 1973.



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C RESEARCH

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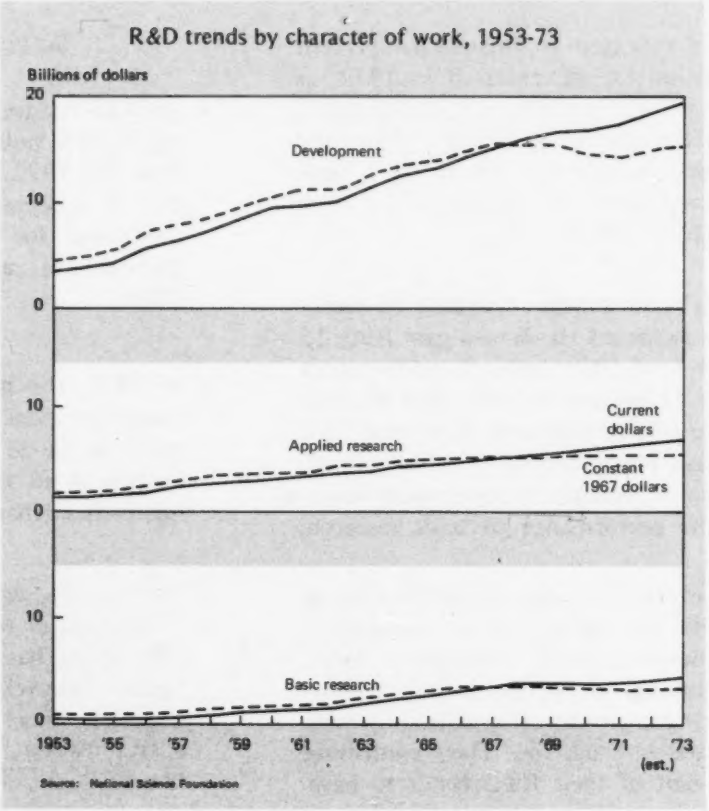

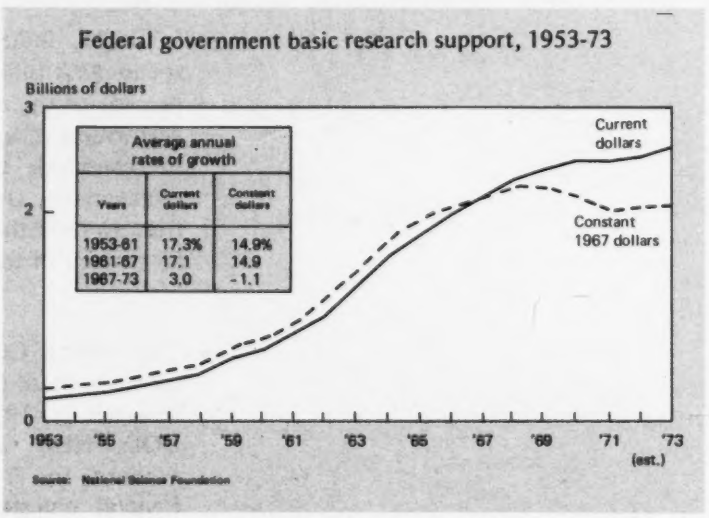

- Industry is expected to finance 14 percent of the Nation's basic research in 1973, as compared with 30 percent in 1953. Industry spends a relatively low percentage of its total R&D dollars on basic research. In 1973, basic research is anticipated to account for 5 percent of total industrial R&D dollars.

- Universities' and colleges' funding of basic research is expected to show a gain from 15 percent of total basic research performance in 1953 to 23 percent in 1973. This sector is expected to assign 79 percent of its total R&D funds to basic research in 1973 as the environment in the universities is particularly favorable for the performance of basic research.

- Nonprofit institutions are expected to finance 5 percent of the Nation's basic research in 1973 as compared with 7 percent in 1953. These institutions are inclined to finance innovative efforts and promote scientific knowledge through various programs. They contribute about one-half of their R&D funds to basic research.

APPLIED RESEARCH

- Applied research performance is expected to reach $6.8 billion in 1973—5 percent more than the 1972 level. In constant dollars, the gain is expected to be 2 percent. Total expenditures for applied research in constant dollars have remained relatively level since 1968.

- In 1973, the proportion of total R&D performance spent on applied research is anticipated to be 23 percent, about the same percentage as in 1972. This ratio has remained relatively unchanged in recent years.

- The industry sector is anticipated to conduct 55 percent of total applied research in 1973. This sector has been the major performer of applied research since 1953, when this series began; its share of applied research performance, however, has decreased from about 70 percent in 1958.

- In 1973, industrial firms are expected to spend $3.8 billion on applied research or 19 percent of their total R&D dollars. The major performers of applied research in industry are the chemicals, electrical equipment and communications, and aircraft and missiles industries. In 1971 these industries performed about 55 percent of total industrial applied research.

- The Federal Government is expected to perform about 24 percent of the Nation's applied research in 1973. Three Federal agencies—DOD, HEW, and NASA—are expected to account for 72 percent of the intramural Federal obligations for applied research.

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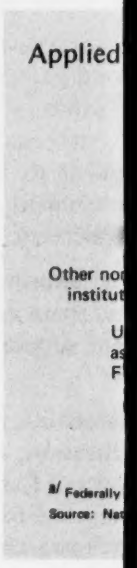

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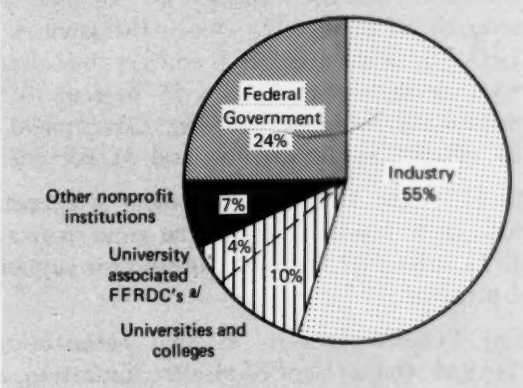
- In 1973, the Federal Government will furnish 53 percent of total applied research funds. HEW, NASA, and DOD are expected to spend 57 percent, 26 percent, and 17 percent, respectively, of their R&D dollars on applied research during this year. Since 1953 the Federal Government has been the primary source of funds for applied research.

- Industry is the next largest source of applied research financing. In 1973 it is expected to finance 41 percent of the Nation's applied research, about the same portion as in 1972. Universities and colleges and other nonprofit institutions are expected to contribute the remaining 6 percent of the total applied research funds in 1973.

Applied research performance, 1973 (est.)



a/ Federally Funded Research and Development Centers
Source: National Science Foundation

DEVELOPMENT

- Expenditures for development by all sectors are estimated to reach $18.8 billion in 1973—a gain of 2 percent over 1972.

- Development activities hold a significant role in the total R&D effort of the Nation. The proportional share of development in total R&D performance has almost always been more than 60 percent.

- The industrial sector is the major performer of development activities. In 1973 this sector is expected to account for 84 percent of total development performance in the Nation as compared with 81 percent in 1953. Because a primary goal of industrial firms is to increase their profits, they direct the bulk of their expenditures on activities related to translating research findings into new and improved products and processes. In 1973 industrial firms are expected to spend 78 percent of their total R&D outlays on development, compared with 19 percent on applied research and 3 percent on basic research.

- Industrial expenditures for development are concentrated in aircraft and missiles, electrical equipment and communication, and machinery. These industries account for two-thirds of the total industrial development performance.

- In 1973 Federal agencies will account for 12 percent of the development performance as compared with 17 percent in 1953. In this area, 75 percent of intramural development activities of the Government will be conducted by DOD. Other Federal agencies with large development programs are NASA, AEC, HEW, and the Department of Transportation (DOT).

- The Federal Government is the largest source of funds for development. In 1973 it is expected to finance 52 percent of all development in the Nation. Since 1968 the Government's share of development funds has decreased from about 60 percent.

- In 1973 the Federal Government for development programs—a drop 5 percent over 1971.

- DOD will allocate more than thr development programs in 1973. Th HEW, and DOT, expect to devote 50 percent, respectively, of their t

- It is anticipated that the industri the Nation's development in 197 15 percent over 1971. This secto all development activities, about

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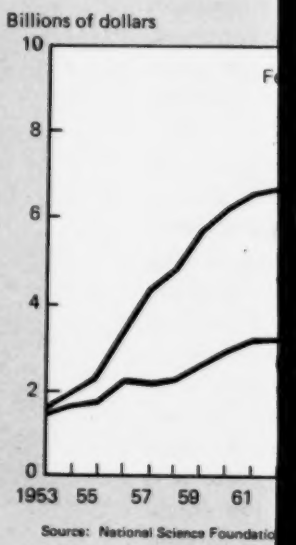

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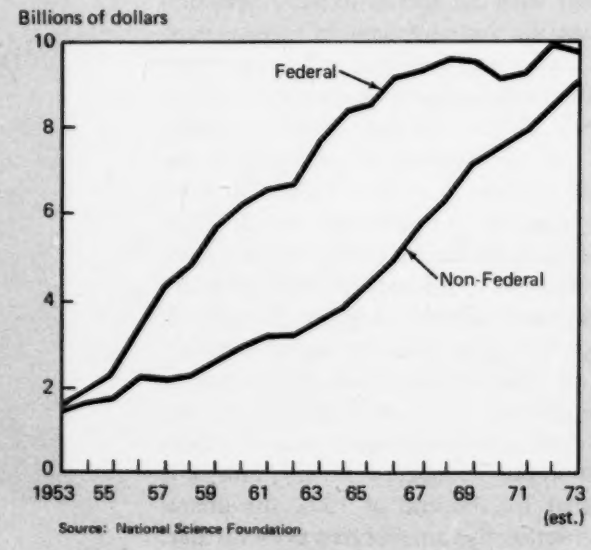
- In 1973 the Federal Government is expected to contribute $9.8 billion for development programs—a drop of 2 percent over 1972, but a gain of 5 percent over 1971.

- DOD will allocate more than three-quarters of its total R&D dollars to development programs in 1973. The other principal agencies, NASA, AEC, HEW, and DOT, expect to devote 50 percent, 67 percent, 16 percent, and 50 percent, respectively, of their total R&D funds to development.

- It is anticipated that the industrial sector will contribute $8.9 billion to the Nation's development in 1973—a gain of 7 percent over 1972 and 15 percent over 1971. This sector is expected to finance 48 percent of all development activities, about the same percent as in 1971 and 1972.

Federal and non-Federal financing of development



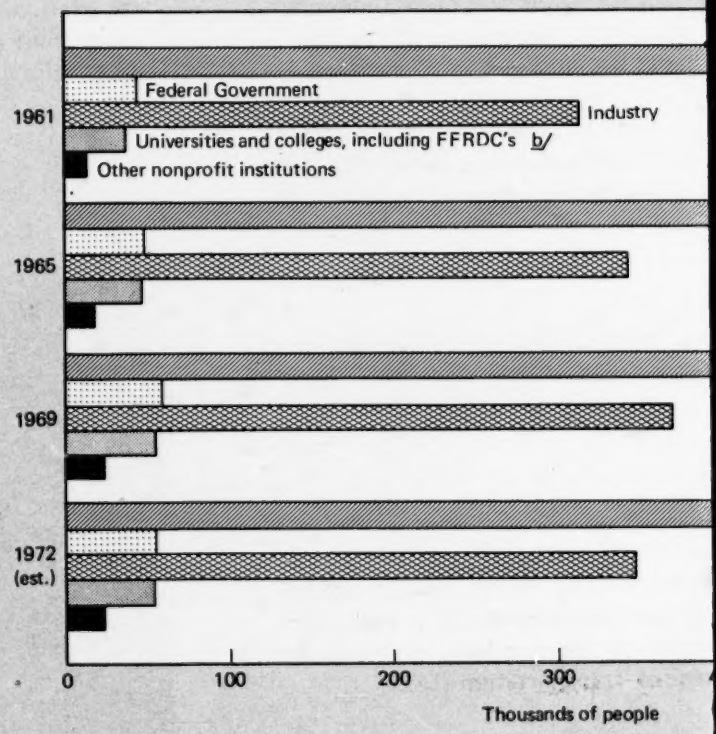
Source: National Science Foundation

R&D MANPOWER

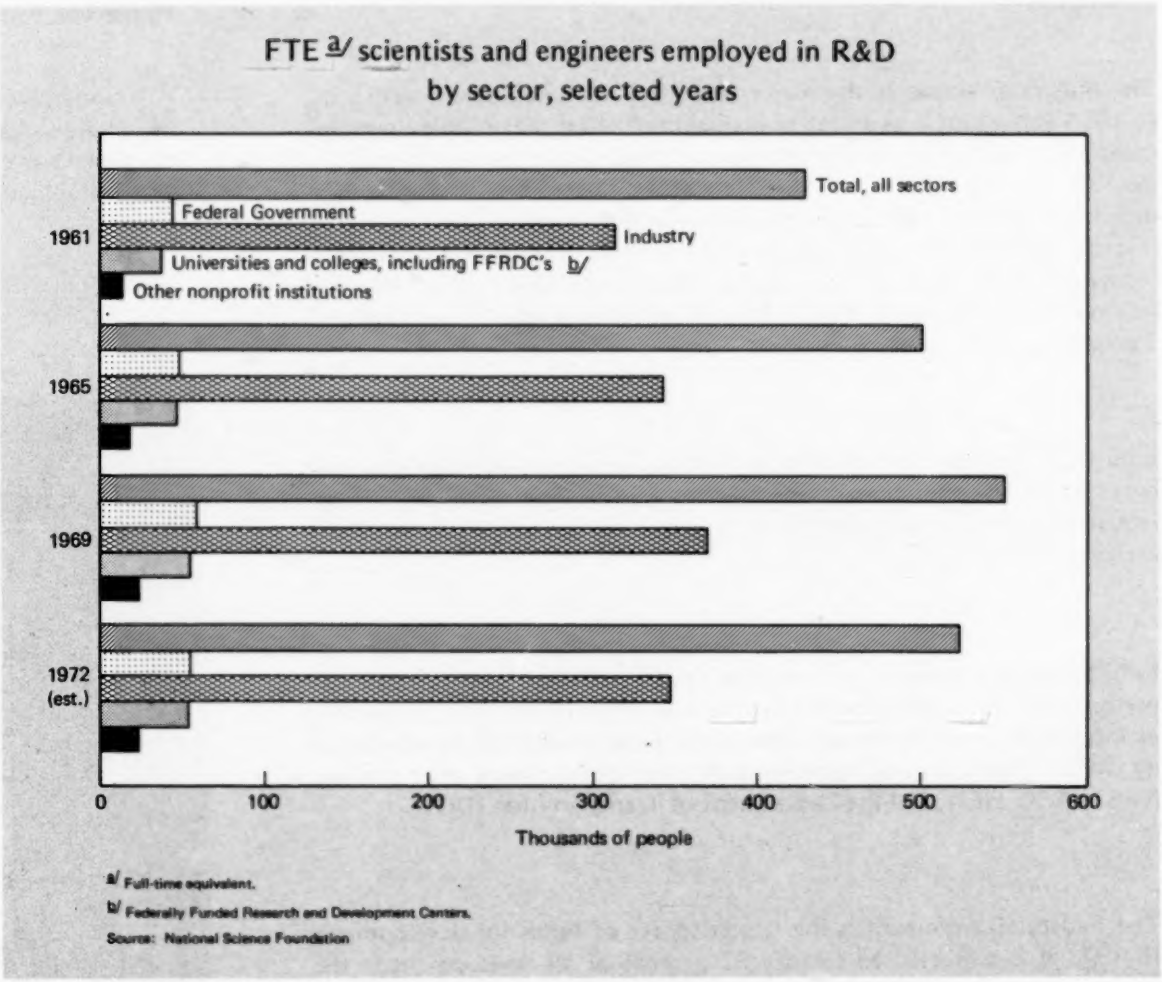
In 1972 about 525,000 scientists and engineers were engaged in R&D work on a full-time-equivalent (FTE) basis in all sectors of the economy. This number represents about one-third of all employed scientists and engineers. In the past 18 years the number of R&D scientists and engineers more than doubled, increasing at an average annual rate of 4.5 percent, in comparison with annual rates of employment growth of 1.7 percent for total civilian employment and 4.1 percent for all professional and technical workers. Since 1969, however, employment of R&D scientists and engineers dropped by about 34,000 from a high of nearly 560,000.

Concurrent with the decline in the proportion of R&D scientists and engineers in recent years, this group experienced higher unemployment rates than their counterparts engaged in teaching, management, and production. Much of these differences can be ascribed in great part to the reduction of support from the Federal defense and space programs for research and development in industry, universities, and research institutions. In mid-1971, 3.5 percent each of scientists and engineers formerly engaged in research and development were unemployed, whereas 1.9 percent of all other scientists and 2.6 percent of all other engineers were unemployed. In late 1971, however, unemployment rates in these occupations began to decline slowly, and it is estimated that by the end of 1972 the unemployment situation had ameliorated even further.

FTE [a] scientists and engineers emplo
by sector, selected years



a/ Full-time equivalent.
b/ Federally Funded Research and Development Centers.
Source: National Science Foundation


FTE a/ scientists and engineers employed in R&D by sector, selected years
Total, all sectors
Federal Government
Industry
Universities and colleges, including FFRDC's b/
Other nonprofit institutions
1961
1965
1969
1972 (est.)
0
100
200
300
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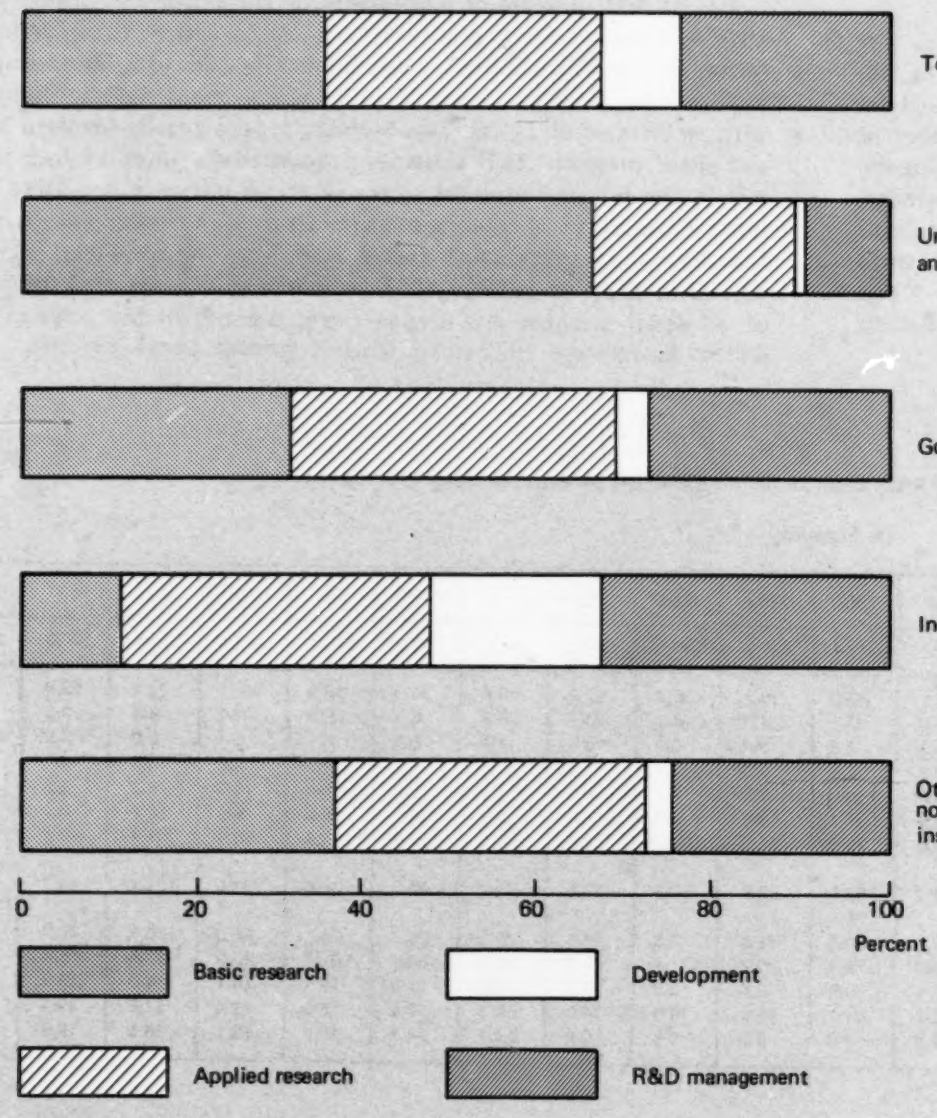
500
600
Thousands of people
a/ Full-time equivalent.
b/ Federally Funded Research and Development Centers.
Source: National Science Foundation

Distribution of scientists among R&D work activities, by sector, 1970



Source: National Science Foundation

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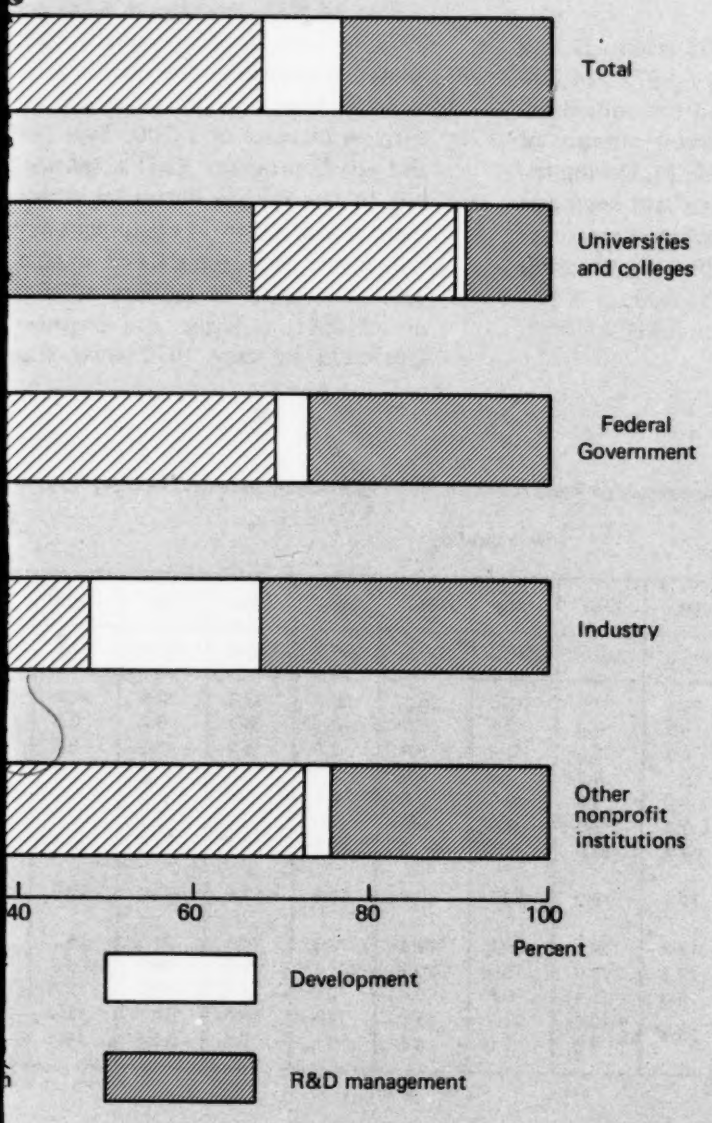

Excluding engineers the distribution of R&D scientists among the four activities associated with research and development—basic research, applied research, development, and R&D management—changed little over the 1960–70 decade. The distribution of scientists with doctorate degrees, however, differs from those with bachelor's and master's degrees. In 1970 about 45 percent of the doctorate degree holders and 25 percent of the nondoctorates were engaged in basic research. These patterns were not uniform among the various science fields. Of those engaged in research and development, more than 60 percent of the doctorates in biology were engaged in basic research compared to less than 20 percent of the R&D doctorate agricultural scientists. One-third of the doctorate social scientists in research and development reported they were primarily engaged in basic research in 1970.

The nature of the R&D activities performed by scientists mainly depends upon the sector of the economy in which they are employed. In 1970 one-third of those in all fields of natural and social sciences and mathematics, for all degree levels combined, were engaged in basic research, and an additional one-third in applied research. In industry, about one-tenth were engaged in basic research and over one-third in applied research, with more than one-half the scientists either in R&D management, or in developmental work.

Private Industry

Private industry employed the FTE number of 356,100 scientists and engineers engaged in research and development in January 1972—14,500 fewer than the previous January. This reduction continued the annual decrease in this group of workers since 1969 when the largest number of industrial R&D scientists and engineers were employed (table 3). During the 12 years from 1957 to 1969 the number of R&D scientists and engineers grew at an average annual rate of 4.5 percent, or an average increase of 13,000 per year, and increased during every year except 1961. In the three years from 1969 to 1972, however, employment fell by 31,000, or 8 percent of the 1969 work force. By 1972, the employment of R&D scientists and engineers was down around the 1966 level.

The 14,500 decrease of R&D scie
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lost in the private industrial sector
ment in the electrical equipment manu
industries, and aircraft and missile
13,100 in 1971. In January 1971 the
of all R&D scientist and engineer
sector; in January 1972 their share

Table 3. Full-time-equivalent number of R&D scientists and engineers, by industry, January 1957–72

[In thousands]

Industry	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	19
Total	229.4	243.8	268.4	292.0	312.1	312.0	327.3	340.2	343.6	353.2	367.2	37
Chemicals and allied products	29.4	31.0	33.5	36.1	37.0	36.5	38.3	35.3	37.9	38.6	36.9	3
Petroleum refining and extraction	6.9	7.4	7.7	9.2	9.0	9.1	8.9	8.1	8.7	8.9	8.7	
Rubber products	4.7	4.7	4.8	5.3	5.5	5.8	5.8	6.0	5.8	5.7	5.8	
Stone, clay, and glass products	(b)	(b)	(b)	(b)	3.6	3.7	3.8	3.3	3.5	3.1	3.3	
Primary metals	5.1	5.2	5.7	6.9	6.9	6.0	5.2	5.1	5.5	5.5	5.9	
Fabricated metal products	8.4	8.3	8.9	7.4	8.6	7.4	6.8	7.0	6.6	6.3	6.3	
Machinery	24.9	27.4	29.4	32.1	33.0	31.5	31.4	27.3	29.4	30.5	33.6	3
Electrical equipment and communication	42.9	47.9	54.8	72.1	79.2	82.3	85.8	89.5	87.8	92.0	98.6	9
Motor vehicles and other transportation equipment	13.6	15.0	16.8	17.8	19.1	20.8	21.1	23.3	24.1	24.8	25.2	2
Aircraft and missiles	58.7	58.6	65.9	72.4	78.5	79.4	90.7	101.1	99.2	99.3	100.4	10
Professional and scientific instruments	10.2	11.0	12.0	10.0	11.1	9.8	9.4	10.8	11.5	12.5	13.0	1
Other manufacturing industries	24.6[c]	27.3[c]	28.9[c]	22.6[c]	12.9	11.7	11.9	13.6	14.0	14.3	15.4	1
Other nonmanufacturing industries					7.5	7.0	8.2	9.8	9.6	11.7	14.1	1

[a] Excludes social scientists
[b] Data included in the "other manufacturing" group.
[c] For years 1957–60, other manufacturing and nonmanufacturing combined. Other manufacturing industries include food and kindred products; textiles, appar products; tobacco products, printing and publishing, leather products and miscellaneous manufacturing.
Source: National Science Foundation.

number of 356,100 scientists and opment in January 1972—14,500 eduction continued the annual de- 969 when the largest number of ere employed (table 3). During the r of R&D scientists and engineers ercent, or an average increase of ery year except 1961. In the three loyment fell by 31,000, or 8 per- he employment of R&D scientists evel.

The 14,500 decrease of R&D scientists and engineers between 1971 and 1972 is a net total composed of losses of 17,200 in twelve industries (or related groups of industries), compensated by gains of 2,700 in employment in four industries, the largest of which was in motor vehicle manufacturing with an increase of 1,700. Two industry groups heavily involved in defense and space program R&D activities accounted for three of four R&D jobs lost in the private industrial sector of the economy during 1971. Employment in the electrical equipment manufacturing and communications services industries, and aircraft and missile manufacturing combined decreased by 13,100 in 1971. In January 1971 these industries accounted for 47 percent of all R&D scientist and engineer employment in the private industrial sector; in January 1972 their share decreased to 45 percent.

Full-time-equivalent number of R&D scientists and engineers, by industry, January 1957–72[a]

[In thousands]

1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
243.8	268.4	292.0	312.1	312.0	327.3	340.2	343.6	353.2	367.2	376.7	387.1	384.1	370.6	356.1
31.0	33.5	36.1	37.0	36.5	38.3	35.3	37.9	38.6	36.9	38.9	40.3	40.2	42.8	41.4
7.4	7.7	9.2	9.0	9.1	8.9	8.1	8.7	8.9	8.7	9.2	10.0	9.9	9.2	8.2
4.7	4.8	5.3	5.5	5.6	5.8	6.0	5.8	5.7	5.8	6.1	6.3	6.8	5.9	5.9
(b)	(b)	(b)	3.6	3.7	3.8	3.3	3.5	3.1	3.3	4.1	4.2	4.6	4.1	3.8
5.2	5.7	6.9	6.9	6.0	5.2	5.1	5.5	5.5	5.9	5.9	6.2	6.3	6.3	6.8
8.3	8.9	7.4	8.6	7.4	6.8	7.0	6.6	6.3	6.3	5.6	6.6	5.9	6.9	6.0
27.4	29.4	32.1	33.0	31.5	31.4	27.3	29.4	30.5	33.6	37.4	39.4	41.4	40.5	41.1
47.9	54.8	72.1	79.2	82.3	85.8	89.5	87.8	92.0	98.6	98.4	101.6	102.4	95.2	87.7
15.0	16.8	17.8	19.1	20.8	21.1	23.3	24.1	24.8	25.2	24.3	25.0	25.1	27.8	29.5
58.6	65.9	72.4	78.5	79.4	90.7	101.1	99.2	99.3	100.4	101.1	99.9	92.6	78.3	72.7
11.0	12.0	10.0	11.1	9.8	9.4	10.8	11.5	12.5	13.0	14.1	15.1	14.8	18.9	18.6
27.3[c]	28.9[c]	22.6[c]	12.9 7.5	11.7 7.0	11.9 8.2	13.6 9.8	14.0 9.6	14.3 11.7	15.4 14.1	16.5 15.1	17.4 15.1	17.8 16.3	19.1 15.6	18.5 15.9

nufacturing combined. Other manufacturing industries include food and kindred products; textiles, apparel; lumber and wood products; paper and allied , leather products and miscellaneous manufacturing.

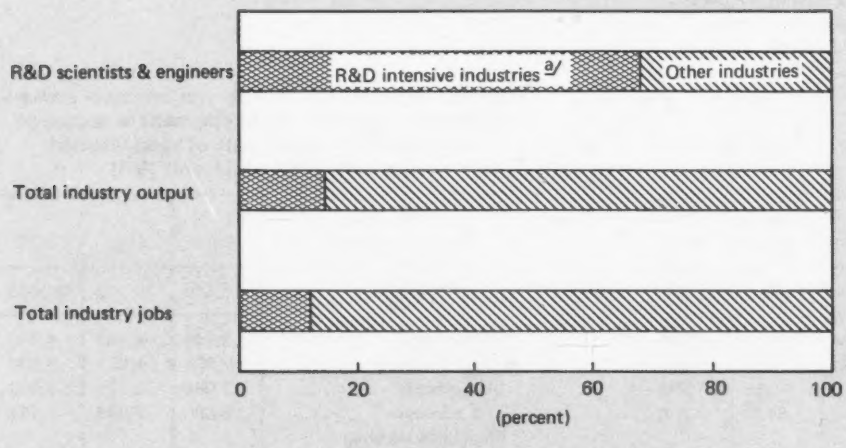
In the industry sector of the economy about 68 percent of the R&D scientists and engineers work in six industries manufacturing goods and providing communications services[1] which also employ 11 percent of the total work force. The remaining industries, employing 89 percent of the total workers in this sector—other manufacturing, services, transportation, construction, mining, public utilities, finance, insurance and real estate—accounted for about 32 percent of the R&D scientists and engineers in 1972.

Large companies (with 10,000 or more employees) dominate in the employment of R&D scientists and engineers. In 1971 these companies employed 28 R&D scientists and engineers per 1,000 employees. By comparison, firms with 5,000 to 10,000 employees had 19 per 1,000. In recent years, industrial firms, in the aggregate, employed 26 scientists and engineers per 1,000 employees.

In terms of the value of produced goods and services of the industrial sector, the six R&D intensive industries produced about 15 percent of the goods and services of the Nation's business sector in 1971.

[1] Includes aircraft, ordnance (missiles), electrical equipment, nonelectrical machinery and chemicals manufacturing, and communication services.

Industrial R&D scientists and engineers in relation to other economic measures, 1971



a/ Aircraft, ordnance (missiles), electrical equipment, machinery, chemicals, and communication services

Source: National Science Foundation

FEDERAL SUPPO
R&D SCIENTIST

In January 1972, Federal Gover
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about three of every five jobs los
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Three of four federally supporte
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Since 1963, when these data were
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Federal funds.

**Table 4. Full-time-equivalent number
supported by Federal fu**

Industry	197
Total	129,0
Chemicals & allied products	3,3
Petroleum refining & extraction	6
Rubber products	7
Machinery	5,2
Electrical equipment & communication	43,7
Motor vehicles & other transportation equipment	6,1
Aircraft & missiles	58,0
Professional & scientific instruments	2,7
Other manufacturing industries	6
Nonmanufacturing industries	8,1

Note: Percents may not add to 100 because of ro
Source: National Science Foundation

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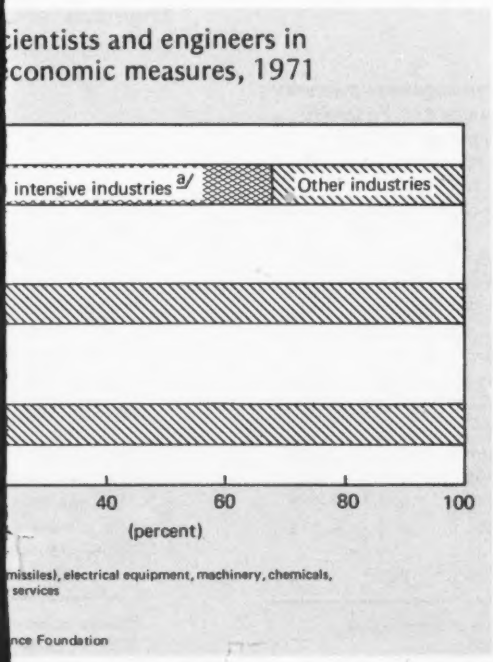

FEDERAL SUPPORT OF INDUSTRIAL R&D SCIENTISTS AND ENGINEERS

In January 1972, Federal Government funds supported 34 percent, or 120,000, of all R&D scientists and engineers in industry. This number shows a decline of 8,900, or 7 percent, from the previous January, and represents about three of every five jobs lost for all industrial R&D scientists and engineers in 1971 (table 4).

Three of four federally supported R&D scientists and engineers working in industry were employed by two major industry groups—electrical equipment manufacturing and communications services, and aircraft and missile manufacturing. The R&D scientists and engineers supported by Federal funds in nonmanufacturing industries accounted for more than one-half the R&D scientists and engineers in these industries, although they represented only 7 percent of all such federally supported workers in the industrial sector.

Since 1963, when these data were first collected, the federally supported share of industrial R&D scientists and engineers has been declining, from about one-half in the beginning of the period to one-third in 1972. These declines resulted from an increase in company-financed R&D activity, and, since the mid-1960's, a reduction in the number of workers supported by Federal funds.

Table 4. Full-time-equivalent number of R&D scientists and engineers in industry supported by Federal funds, January 1971 and 1972

Industry	Number		Percent distribution		Percent of total industrial R&D scientists and engineers	
	1971	1972	1971	1972	1971	1972
Total	129,000	120,000	100.0	100.0	34.8	33.7
Chemicals & allied products	3,300	2,900	2.6	2.4	7.7	7.0
Petroleum refining & extraction	600	500	.5	.4	6.5	6.1
Rubber products	700	600	,5	,5	11,9	10.2
Machinery	5,200	5,500	4.0	4.6	12.8	13.4
Electrical equipment & communication	43,700	37,700	33.9	31.4	45.9	43.0
Motor vehicles & other transportation equipment	6,100	6,000	4.7	5.0	21.9	20.3
Aircraft & missiles	58,000	55,600	45.0	46.3	74.1	76.5
Professional & scientific instruments	2,700	2,600	2.1	2.2	14.3	14.0
Other manufacturing industries	600	400	.5	.3	1.6	1.1
Nonmanufacturing industries	8,100	8,300	6.3	6.9	51.9	52.2

Note: Percents may not add to 100 because of rounding
Source: National Science Foundation

Other Sectors

In 1971 about one-fifth of all scientists and engineers employed in universities and colleges (excluding FFRDC's) were primarily engaged in research and development. Between 1965 and 1971 R&D scientist and engineer employment in universities and colleges increased by 8,200 to 46,000—a growth of 21 percent from the 1965 total (table 5). Two-thirds of this increase occurred in the life sciences, which maintained its position as the largest discipline in this sector's R&D effort, with 65 percent of the total in 1971. R&D employment in the physical sciences and engineering together represented another 25 percent of the total.

In 1971, there were 36,300 graduate students performing research and development in universities and colleges. This number represented the full-time equivalent of 17,600 R&D workers, and accounted for two-fifths of the working graduate students. The distribution follows:

Field of employment	Number
Total	36,300
Engineering	8,900
Physical sciences	10,500
Mathematics	1,500
Life sciences	11,200
Social sciences[a]	4,200

[a]Excludes historians, political scientists, and other social scientists

Federally Funded Research and Development Centers (FFRDC's) administered by universities and colleges employed 10,900 R&D scientists and engineers in 1971. Between 1965 and 1971 R&D scientist and engineer employment at FFRDC's dropped by less than 2 percent,

Table 5. Numbers of scientists and engineers primarily engaged in research and development in universities and colleges, by broad field of specialization, January 1965, 1969, and 1971

Broad field of specialization	1965	1969	1971
All fields	38,769	45,120	46,941
Engineering	4,153	4,976	4,839
Physical science	5,927	6,970	7,314
Chemistry	2,335	2,685	2,579
Physics	2,132	2,394	2,411
Other	1,460	1,891	2,324
Mathematics	932	1,669	1,446
Life sciences	24,955	28,307	30,433
Social science and psychology[a]	2,802	3,198	2,909

[a]Social science includes economists and sociologists.
Source: National Science Foundation.

Table 6. Numbers of scientists and engineers primarily engaged in research and development in Federally Funded Research and Development Centers, by broad field of specialization, January 1965, 1969, and 1971

Broad field of specialization	1965	1969	1971
Total	11,055	11,004	10,882
Engineering	4,914	4,960	5,034
Physical science	4,563	4,294	4,225
Chemistry	1,409	1,221	1,175
Physics	2,454	2,634	2,589
Other	700	439	461
Mathematics	940	1,085	1,083
Life sciences	656	414	376
Social science and psychology[a]	129	251	164

[a]Social science includes economists and sociologists.
Source: National Science Foundation.

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Source: National Science Foundation.

accounted for entirely by a decline in the physical and life sciences (table 6). Engineers and physical scientists represented the bulk of 1971 employment with 46 percent and 39 percent, respectively, of all R&D scientists and engineers. Ten percent of R&D workers were mathematicians.

About 400 nonprofit institutions in 1970 employed 21,500 scientists and engineers engaged in R&D activities, somewhat less than in 1967 but considerably more than in 1965. Over one-half the gain in R&D employment in these institutions between 1965 and 1970 was accounted for by an increase in social scientists and psychologists. Life scientists and engineers comprised the bulk of the remaining increase. Mathematicians registered a decline in employment in the late 1960's (table 7). In 1970, as in prior years, life scientists represented the largest single discipline, with about one-third of this sector's R&D scientist and engineer employment. Engineers and social scientists (including psychologists) each represented 22 percent.

Table 7. Numbers of scientists and engineers primarily engaged in research and development in nonprofit institutions, by broad field of specialization, January 1965, 1967, and 1970

Broad field of specialization	1965	1967	1970
All fields	18,499	22,129	21,556
Engineering	3,745	4,740	4,746
Physical science	2,991	3,571	3,370
Mathematics	2,065	2,172	1,366
Life sciences	6,600	7,338	7,274
Social science and psychology[a]	3,098	4,308	4,800

[a]Social science includes economists and sociologists.
Source: National Science Foundation.

In 1971 the Federal Government employed an estimated 44,800 civilian scientists and engineers who were performing research or development (excluding R&D management). DOD employed one-half of these workers, including two-thirds of the engineers, more than four-fifths of the mathematical specialists, and two-fifths of the physical scientists (table 8). NASA employed 15 percent of the R&D scientists and engineers; predominantly engineers and physical scientists. The Departments of Agriculture (USDA), Interior, and Health, Education, and Welfare employed most of the remaining R&D scientists and engineers.

Between 1967–71 the employment of R&D scientists and engineers in the Federal Government remained fairly stable—around 45,000. DOD has maintained its share of approximately one-half these workers since 1967. Decreasing numbers of R&D scientists and engineers have been employed by NASA and the Departments of Agriculture and Interior. Increases in employment have occurred mainly in Commerce and HEW (table 9).

State and local governments perform little research and development in their own facilities. According to the 1967–68 State governments survey, State governments employed over 3,000 scientists and engineers who were performing research and development on a FTE basis during those years—about 5 percent of the total number. Two-thirds of the R&D employment was engaged in activities divided evenly between two functional areas, health and natural resources (including agriculture). Highway construction and maintenance, and education (excluding higher education) each accounted for 10 percent of the R&D professionals. The three most populous States—California, New York, and Illinois, with one-fourth of the Nation's population—employed nearly 40 percent of the R&D scientists and engineers in all State governments.

Table 8. Distribution of civilian R&D scientists and engineers in the Federal Government, by agency and occupation[a]

Agency	Total	Engineers	Physical scientists	Mathematicians and statisticians	Biological scientists	Social scientists
Total (number)[b]	44,800	21,300	14,200	2,800	4,500	2,000
			Percent distribution			
	100.0	100.0	100.0	100.0	100.0	100.0
Department of Defense	52.0	67.0	40.8	81.3	10.1	24.7
Department of Agriculture	8.8	2.2	7.2	3.2	41.2	27.1
Department of Health, Education, and Welfare	5.8	.4	7.3	2.2	24.8	13.7
Department of the Interior	7.3	3.2	14.5	1.7	8.8	4.2
National Aeronautics and Space Administration	15.1	21.4	15.2	.2	1.4	.5
Department of Commerce	5.1	1.9	9.5	5.6	7.4	2.9
Department of Transportation	1.5	2.1	.7	2.6	.4	2.7
Other agencies	4.3	1.9	4.9	3.2	5.8	24.1

[a] Refers to October 1971.

[b] Excludes uniformed military, scientists and engineers, and administration of research and development.

Note: Percents may not add to 100 because of rounding.

Source: National Science Foundation, based on data of the U.S. Civil Service Commission.

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Local governments in 1969 employed about 1,000 FTE R&D scientists and engineers. The largest amount of R&D activity took place in municipal and county hospitals in the clinical sciences. Elementary and secondary education, police and corrections activities, and sanitation were also represented. The local government R&D effort is highly concentrated. Five cities or city-county combinations accounted for 40 percent of the research and development performed by local governments in fiscal year 1969.

Although data on R&D employment are not available for more recent years (employment in State and local governments is not included in any of the statistical tables), State and local government R&D activities have been slowly growing, especially those activities relating to functions such as environmental protection and public safety.

D scientists and engineers in the Federal Government, by agency and occupation[a]

	Total	Engineers	Physical scientists	Mathematicians and statisticians	Biological scientists	Social scientists
. .	44,800	21,300	14,200	2,800	4,500	2,000
			Percent distribution			
	100.0	100.0	100.0	100.0	100.0	100.0
. .	52.0	67.0	40.8	81.3	10.1	24.7
. .	8.8	2.2	7.2	3.2	41.2	27.1
. .	5.8	.4	7.3	2.2	24.8	13.7
. .	7.3	3.2	14.5	1.7	8.8	4.2
. .	15.1	21.4	15.2	.2	1.4	.5
. .	5.1	1.9	9.5	5.6	7.4	2.9
. .	1.5	2.1	.7	2.6	.4	2.7
. .	4.3	1.9	4.9	3.2	5.8	24.1

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ause of rounding.
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Table 9. Employment of civilian R&D scientists and engineers in the Federal Government, 1967, 1969 and 1971[a]

[In thousands]

Agency	1967	1969	1971
Total[b]	45.9	46.5	44.8
Department of Defense	22.7	24.2	23.3
Department of Agriculture . .	4.7	4.8	4.0
Department of Health, Education, and Welfare .	1.7	1.7	2.6
Department of Interior	3.7	3.8	3.2
National Aeronautics and Space Administration . .	7.5	7.6	6.8
Department of Commerce . . .	1.7	1.8	2.3
Department of Transportation .	0.6	0.6	0.7
Other agencies	3.3	2.0	1.9

[a] Refers to October of each year.
[b] Excludes uniformed military scientists and engineers and administration of research and development.

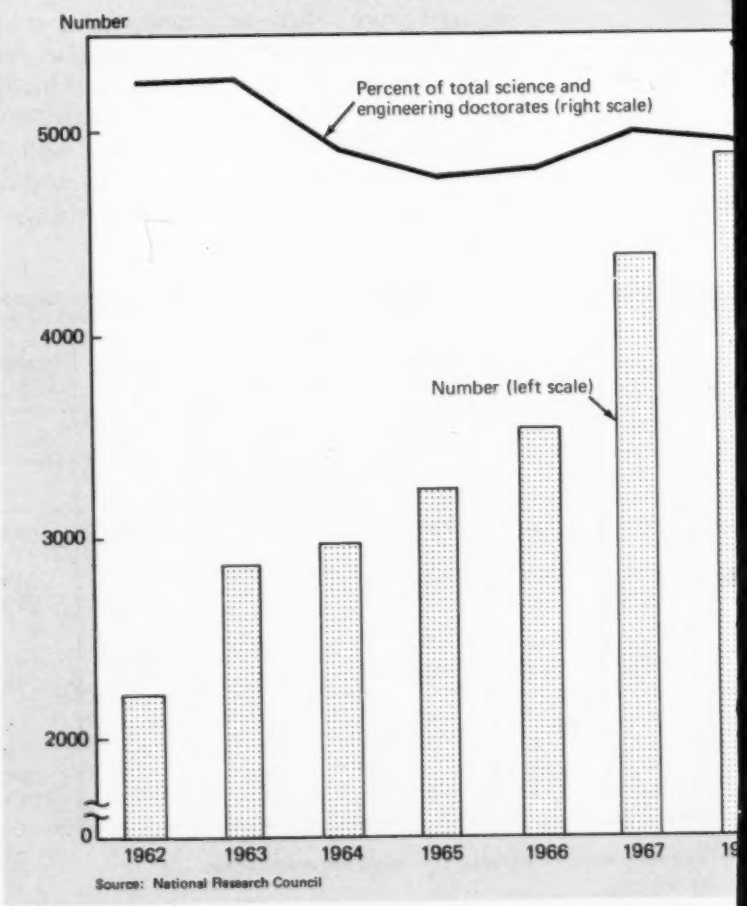
Source: National Science Foundation, based on data of the U.S. Civil Service Commission.

New Manpower for Research and Development

One of the primary sources of new manpower to conduct research and development is recent doctorate recipients. Between 1962–71 a total of nearly 40,000 new doctorates in the physical, life, and social sciences, mathematics, and engineering planned to obtain employment in R&D activities after graduation. This number represented about one-half the new doctorates from U.S. universities in these fields who had definite postgraduate employment plans. In each year during the 1962–69 period between 48 percent and 53 percent of the new doctorates first expected to be employed in R&D activities. In 1970 and 1971, the percentage dropped to 45 percent and 40 percent, respectively. The annual numbers planning to enter research and development rose steadily between 1962–70, from 2,200 to 5,200, and fell to 4,500 in 1971. This decline consisted wholly of decreases in planned R&D employment in the physical sciences, mathematics, and engineering while the life and social sciences remained at their 1970 levels.

New doctorate recipients in the physical sciences (physics, chemistry, and earth sciences) have been more likely to enter research and development than graduates in other fields. During the 10-year period 1962–71, 13,000 of the 19,000 doctorates in these fields expected to enter R&D activities. Also, almost two-thirds of the engineering graduates and one-half the life sciences (biological and agricultural sciences) graduates planned to enter R&D work. Smaller proportions of mathematicians and social scientists (psychology, sociology, economics, anthropology, political science, and public administration) planned to enter R&D work—30 percent and 22 percent, respectively, on the average during the decade.

Trends in new science and engineerin
planning to enter R&D work, 1



Source: National Research Council

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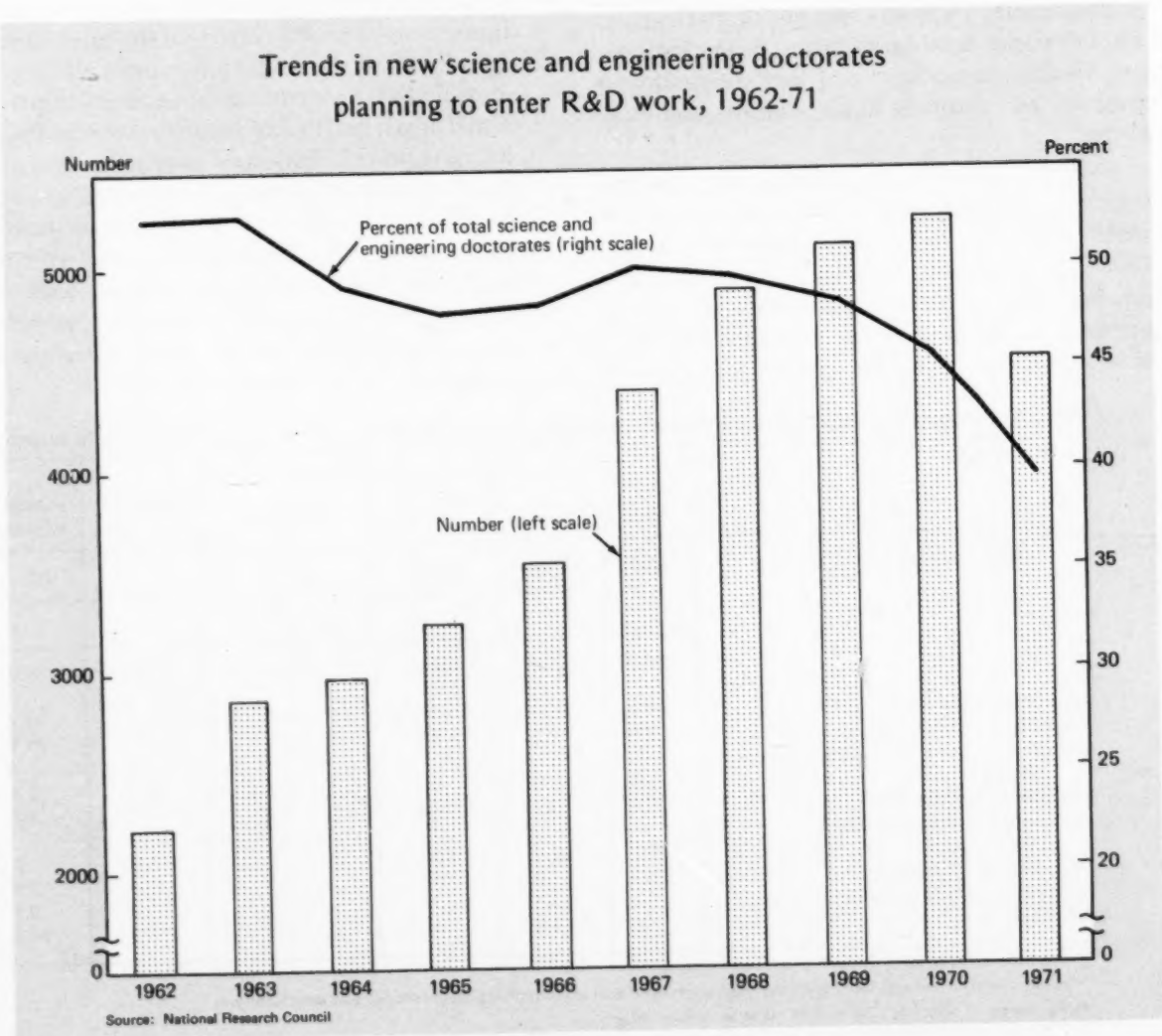

Another source of new manpower to conduct research and development is the immigrant scientist or engineer. In mid-1970, a special survey of foreign-born scientists and engineers who immigrated to the United States between 1964–69 indicated that 48 percent were performing research and development. The immigrants surveyed were a sample of the approximately 60,000 scientists and engineers who were admitted to the United States during the latter half of the sixties. The survey indicated that about two-thirds of these scientists and mathematicians were engaged in R&D activities in 1970, as were one-third of the engineers.

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Projections of 1980 Employment of R&D Scientists and Engineers

If the trends of the late 1960's in the cost of research and development per worker continue for the remainder of the 1970's, projected expenditures for research and development in 1980—ranging from $28.4 billion to $43.5 billion (in 1971 prices)—imply that an estimated 530,000 to 777,000 scientists and engineers may be engaged in R&D work by 1980.

The academic specialties demanded in future years for R&D scientists and engineers will depend, in large part, upon the priorities set for various national goals such as improved health care, pollution control, transportation, housing, defense, and space exploration programs. The distribution of R&D scientists and engineers among the R&D performing sectors in 1980 is likely to be similar to that of 1971, with two-thirds in industry, one-eighth each in the Federal Government and universities and colleges, and the remainder in nonprofit organizations and FFRDC's.

APPENDIXES

A. Basis for Sectoring and Technical Notes

B. Statistical Tables

APPENDIX A

Basis for Sectoring

The four-sector division followed by the National Science Foundation in surveying R&D funds and personnel and maintaining the time series for expenditures and employment is based on an approach that attempts to take account of both the legal nature and major functions of organizations active in financing and performing basic research, applied research, and development. However, grouping diverse types of organizations into discrete sectors requires certain arbitary judgments because of the mixed nature of many organizations, particularly those in the university and other nonprofit sectors.

The *Federal sector* is made up of the agencies of the Federal Government. The *industry sector* consists of both manufacturing and nonmanufacturing companies. Manufacturing is classified in major industry groupings; and nonmanufacturing, which includes organizations such as those in selected service industries, is treated as a unit. FFRDC's administered by industrial firms are also included.

The *universities and colleges sector* is composed of all institutions of higher education, both public and private. The term "universities and colleges" is used in this report to refer to the academic institutions as a group without the associated FFRDC's administered by the schools for various Federal agencies. The universities and colleges comprise the following:

> Colleges of liberal arts; schools of arts and sciences; professional schools, such as engineering and medical schools, including affiliated hospitals; associated research institutions, and similar organizations, which are integral parts of the universities and colleges; agricultural experiment stations, and associated schools of agriculture.

Funds used at the universities and attributed to the universities sector as a source consist of several compo-

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DIX A

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Funds used at the universities and attributed to the universities sector as a source consist of several components: (a) State and local government funds separately budgeted for research and development, (b) the direct or indirect costs of R&D performance sponsored by outside organizations that were defrayed in part by universities and colleges in accordance with cost sharing or other arrangements, and (c) unrestricted or general funds which the institutions themselves have been free to allocate for research either through their instructional or departmental budget or through their own separately budgeted research. Funds from the Federal Government, industry, or other nonprofit institutions, which are supplied in the form of grants or contracts for research or development at a university, are credited to the appropriate source in the performance of research and development by universities and colleges. Thus, research contracts from industry are treated as university performance funded by industry as the source, whereas funds given to the institution by industry for general educational purposes and used by the school, at its discretion, for research, are treated as university performance financed with the university's own funds.

Institutions in the *other nonprofit sector* fall into two general groups: (1) organizations that are primarily granting in nature, namely private philanthropic foundations and voluntary health agencies, and (2) public and private organizations that are involved in performing research and development, comprising separately incorporated nonprofit research institutes, professional societies, academies of science, museums, zoological gardens, botanical gardens, arboretums, nonprofit hospitals, and FFRDC's administered by nonprofit organizations.

In this report, both the university and the other nonprofit sectors contain private and public institutions—the latter are closely associated with State or local government. A number of organizations in both sectors, as well as in industry, also receive State and local government funds.

Technical Notes

Revisions of R&D Time Series Since December 1971

FUNDS

Federal Government. Data were revised based on the annual survey of R&D activities by Federal agencies covering fiscal years 1971, 1972, and 1973.

Industry. Data were revised for 1970 on the basis of the annual "shuttle" questionnaire that enables respondents to revise the figure reported for the preceding year when they report on the current year. Data for 1971 were obtained from the 1971 industrial R&D survey.

Universities and colleges. Data for 1971–72 were revised in the light of new information obtained in the 1973 survey.

Other nonprofit institutions. Data for 1964 to 1969 were based on the 1969 survey and on the basis of detailed information from the National Institutes of Health on voluntary nonprofit hospitals.

Data for 1971 are classified as preliminary because a final report on intramural performance of research and development was available only for the Federal sector. In addition, preliminary data from the 1971 industrial R&D survey and the 1971 universities and colleges R&D survey were available. Estimates for 1972 and 1973 are extensions of the regular time series, taking into account trends shown in *Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1971, 1972, and 1973,* Vol. XXI,[1] as well as other related information.

Estimates of R&D performance by State and local government agencies (except at universities and colleges) have not been included in this report because of insufficient survey data.

[1] National Science Foundation, *Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1971, 1972, and 1973,* Vol. XXI (NSF 72-317) (Washington, D.C. 20402: Supt. of Documents, U.S. Government Printing Office), 1973.

Federal intramural basic research, applied research, and development data for 1971 have been revised due to changes in the reporting techniques of certain Federal agencies. It is not now feasible, under current reporting systems, to determine what changes should be made in prior year totals. Consequently, prior year funding data reported by these agencies have not been revised in this report.

MANPOWER

Data for 1971 were based on surveys of Federal Government personnel as of October 1971, industry as of January 1971 and January 1972, other nonprofit organizations as of January 1970, and universities and colleges as of January 1973, and other related sources.

Concepts and Definitions

Research and development in this report consist of basic and applied research in the sciences (including medical sciences) and in engineering and activities in development, all defined below. In terms of fields, the natural sciences—life, physical, and engineering—as well as the social and psychological sciences are covered in the Federal, universities, and other nonprofit sectors. Industry coverage is limited, at present, to the natural sciences.

Research, which is made up of basic and applied, is systematic, intensive study directed toward fuller scientific knowledge of the subject studied.

Basic research. For three of the sectors—Federal Government, universities and colleges, and other nonprofit institutions—the definition of basic research stresses that it is directed toward increases of knowledge in science with "... the primary aim of the investigator ... a fuller knowledge or understanding of the subject under study, rather than a practical application thereof." To take account of an individual industrial company's commercial goals, the definition for the industry sector is modified to indicate that basic research projects represent "original investigations for the advancement of scientific knowledge ... which do not have specific commercial objectives, although they may be in fields

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Applied research. The core definition in the NSF questionnaire sent to the universities and colleges is: "Applied research is directed toward practical application of knowledge." Here again, the definition for the industry survey takes account of the characteristics of industrial organizations—it covers ". . . research projects which represent investigations directed to discovery of new scientific knowledge and which have specific commercial objectives with respect to either projects or processes." By this definition, applied research in industry differs from basic research chiefly in terms of objectives of the reporting company.

Development. The NSF survey concept of development may be summarized as ". . . the systematic use of scientific knowledge directed toward the production of useful materials, devices, systems or methods, including design and development of prototypes and processes."

CURRENT OPERATING COSTS

Funds used for research and development, reported in this study, refer to current operating costs, consisting of both direct and indirect costs including depreciation, insofar as this information is available to respondents. Capital expenditures are excluded by definition and this is followed in both the industry and other nonprofit sectors. Under the accounting practices of some Federal agencies, particularly the Department of Defense, data on Federal R&D funds, which are available in detail only in terms of obligations rather than expenditures, do not include an allowance for depreciation but do include some obligations for capital items.

PERFORMER-REPORTING BASIS

In the Foundation's surveys, respondents in all four sectors indicate the amounts they spend on research and development in their own sector and the sources of these funds. The National Science Foundation bases all national totals on data as reported by performers because institutions doing research and development are in the best position to: (a) indicate how much they spent in the actual conduct of research and development in a given

year, (b) classify their work as basic, applied, etc., and (c) identify the sector of the economy in which their financing originated. The use of performer reporting throughout also reduces the possibility of double counting. Because the national time series on Federal funds spent in research and development are based on expenditures reported by organizations which have actually performed the research and development, they differ from the series in the *Federal Funds for Research, Development, and Other Scientific Activities* on agency obligations for research and development to be performed in the non-Federal sectors. Federal agency obligations are used in the series only for intramural performance in agency laboratories where they are treated as the equivalent of expenditures. Expenses of Federal personnel engaged in planning and administering intramural and extramural R&D programs are also included in the intramural performance total.

There have been surveys in all four sectors thus far in the NSF time series for the following years: 1953–54, 1957-58, 1964, and 1966. In general, the Federal Government and industry have been surveyed every year, but it has not been possible to maintain the same frequency for the universities and other nonprofit institutions. National data for other years are based on survey data on the performance of total research and development, basic research, applied research, and development from the Federal and industry sectors and on estimates for the university and other nonprofit sectors.

SINGLE-YEAR DESIGNATION FOR NATIONAL TOTALS

Data for calendar year 1953 for industry and nonprofit institutions are combined with Federal intramural and university data for fiscal year 1953 (that is, July 1952 through June 1953) in the R&D funds series. The sector data for the years following 1953 are grouped accordingly and the annual national totals are based on this phasing.

FULL-TIME-EQUIVALENT (FTE) NUMBER OF SCIENTISTS AND ENGINEERS

The concept of the FTE provides a common denominator for combining the number of full-time employees with an FTE number of part-time employees to achieve a quantitative measure of manpower input. The minimum standard for inclusion of scientists and engineers was the performance of professional scientific or engineering work in research and development, requiring a bachelor's degree, or its equivalent, in science or engineering. In the industry, university, and other nonprofit sectors, both the manpower and expenditures data for each year were obtained in the same surveys; in the Federal sector, data on expenditures and civilian scientists and engineers were reported in different inquiries, and estimates of military scientists and engineers were obtained separately.

DEFENSE-SPACE CLASSIFICATION

Defense expenditures consist of all R&D spending by DOD and a portion of AEC funds. Space R&D expenditures are those of NASA. The space activities of DOD are included as spending on defense. The space activities of other Federal agencies are not included; it is estimated they account for less than 5 percent of all space R&D spending. This series has been revised to include R&D performance reporting where available.

APPENDIX B

Statistical Tables

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Table B–1. Transfers of funds expended annually for performance of research and development by sector, dis

[Dollars in millions]

Year	Total R&D	Federal Government		Industry [b]			Universities and colleges					Associated F	
			Source		Sources			Sources					S
		Total funds used	Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	F G
1953 ...	5,207	1,010	1,010	3,630	1,430	2,200	[e]334	138	19	151	26	121	
1954 ...	5,738	1,020	1,020	4,070	[e]1,750	[e]2,320	377	160	22	167	28	141	
1955 ...	6,279	905	905	4,640	[e]2,180	[e]2,460	[e]409	169	25	185	30	180	
1956 ...	8,483	1,040	1,040	6,605	3,328	3,277	[e]480	213	29	204	34	194	
1957 ...	9,912	1,220	1,220	7,731	4,335	3,396	[e]531	229	34	230	38	240	
1958 ...	10,870	1,374	1,374	8,389	4,759	3,630	592	254	39	257	42	293	
1959 ...	12,540	1,640	1,640	9,618	5,635	3,983	[e]682	306	39	290	47	338	
1960 ...	13,730	1,726	1,726	10,509	6,081	4,428	[e]825	405	40	328	52	360	
1961 ...	14,552	1,874	1,874	10,908	6,240	4,668	[e]969	500	40	371	58	410	
1962 ...	15,665	2,098	2,098	11,464	6,435	5,029	[e]1,143	613	40	424	66	470	
1963 ...	17,371	2,279	2,279	12,630	7,270	5,360	[e]1,359	760	41	485	73	530	

expended annually for performance of research and development by sector, distributed by source, 1953–73[a]

[Dollars in millions]

Industry [b]			Universities and colleges					Associated FFRDC's [c]		Other nonprofit institutions [b]			
	Sources			Sources					Source		Sources		
Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions [d]
3,630	1,430	2,200	[e]334	138	19	151	26	121	121	112	60	20	32
4,070	[e]1,750	[e]2,320	377	160	22	167	28	141	141	[e]130	67	25	38
4,640	[e]2,180	[e]2,460	[e]409	169	25	185	30	180	180	[e]145	75	28	42
6,605	3,328	3,277	[e]480	213	29	204	34	194	194	[e]164	84	30	50
7,731	4,335	3,396	[e]531	229	34	230	38	240	240	190	95	30	65
8,389	4,759	3,630	592	254	39	257	42	293	293	[e]222	111	31	80
9,618	5,635	3,983	[e]682	306	39	290	47	338	338	[e]262	140	35	87
0,509	6,081	4,428	[e]825	405	40	328	52	360	360	[e]310	180	40	90
0,908	6,240	4,668	[e]969	500	40	371	58	410	410	[e]391	240	41	110
1,464	6,435	5,029	[e]1,143	613	40	424	66	470	470	[e]490	310	45	135
2,630	7,270	5,360	[e]1,359	760	41	485	73	530	530	[e]573	380	48	145

Table B–1. Transfers of funds expended annually for performance of research and development by sector, distribute

[Dollars in millions]

Year	Total R&D	Federal Government		Industry [b]			Universities and colleges					Associated FFRD	
			Source		Sources			Sources					Sourc
		Total funds used	Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Feder Gover ment
1964 ...	19,214	2,838	2,838	13,512	7,720	5,792	1,595	916	41	555	83	629	629
1965 ...	20,439	3,093	3,093	14,185	7,740	6,445	[e]1,822	1,073	41	615	93	629	629
1966 ...	22,264	3,220	3,220	15,548	8,332	7,216	2,085	1,262	42	673	108	630	630
1967 ...	23,613	3,396	3,396	16,385	8,365	8,020	[e]2,329	1,409	48	753	119	673	673
1968 ...	25,119	3,493	3,493	17,429	8,560	8,869	2,599	1,572	55	841	131	719	719
1969 ...	26,179	3,501	3,501	18,318	8,451	9,867	[e]2,705	1,600	60	900	145	725	725
1970 ...	26,566	3,853	3,853	18,062	7,779	10,283	2,856	1,658	62	970	166	737	737
1971 ... (prel.)	27,315	4,153	4,153	18,314	7,671	10,643	[e]3,070	1,724	70	1,099	177	716	716
1972 ... (est.)	29,150	4,480	4,480	19,540	8,145	11,395	3,280	1,788	77	1,226	189	769	769
1973 ... (est.)	30,100	4,500	4,500	20,300	8,100	12,200	3,425	1,860	83	1,290	192	800	800

[a] All data are based on reports by performers.

[b] Expenditures for Federally Funded Research and Development Centers administered by both industry and by nonprofit institutions are included in the totals of their respective sectors.

[c] FFRDC's administered by individual universities and colleges and by university-consortia.

[d] Includes State and local government funds.

[e] Estimates derived from related information becaus this year or this item was not obtained in survey.

pended annually for performance of research and development by sector, distributed by source, 1953–73[a]—Cont.

[Dollars in millions]

Industry [b]			Universities and colleges					Associated FFRDC's [c]		Other nonprofit institutions [b]			
	Sources			Sources					Source		Sources		
Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions [d]
13,512	7,720	5,792	1,595	916	41	555	83	629	629	640	450	47	143
14,185	7,740	6,445	[e]1,822	1,073	41	615	93	629	629	[e]710	498	53	159
15,548	8,332	7,216	2,085	1,262	42	673	108	630	630	781	546	59	176
16,385	8,365	8,020	[e]2,329	1,409	48	753	119	673	673	[e]830	577	66	187
17,429	8,560	8,869	2,599	1,572	55	841	131	719	719	[e]879	608	73	198
18,318	8,451	9,867	[e]2,705	1,600	60	900	145	725	725	930	640	81	209
18,062	7,779	10,283	2,856	1,658	62	970	166	737	737	[e]1,058	748	90	220
18,314	7,671	10,643	[e]3,070	1,724	70	1,099	177	716	716	[e]1,062	732	100	230
19,540	8,145	11,395	3,280	1,788	77	1,226	189	769	769	1,081	741	105	235
20,300	8,100	12,200	3,425	1,860	83	1,290	192	800	800	1,075	725	110	240

Development Centers administered by both industry
e totals of their respective sectors.
and colleges and by university-consortia.

[d] Includes State and local government funds.

[e] Estimates derived from related information because either no sector survey was conducted for this year or this item was not obtained in survey.

Table B–2. Transfers of funds expended annually for performance of basic research by sector, distributed

[Dollars in millions]

Year	Total basic research	Federal Government		Industry [b]			Universities and colleges					Assoc FFRD
			Source		Sources			Sources				
		Total funds used	Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used
1953 ...	489	101	101	151	[e]19	[e]132	[e]173	73	12	73	15	33
1954 ...	548	102	102	[e]166	23	143	206	90	14	85	17	39
1955 ...	608	90	90	[e]189	27	162	[e]237	103	16	99	19	49
1956 ...	747	104	104	253	[e]37	[e]216	[e]286	130	18	116	22	51
1957 ...	857	122	122	271	[e]41	[e]230	[e]337	155	21	136	25	65
1958 ...	973	126	126	295	[e]43	[e]252	390	178	24	159	29	78
1959 ...	1,155	173	173	320	[e]72	[e]248	[e]468	226	24	185	33	92
1960 ...	1,326	160	160	376	[e]79	[e]297	[e]576	299	24	215	38	97
1961 ...	1,543	206	206	395	[e]81	[e]314	[e]701	382	25	250	44	115
1962 ...	1,886	251	251	488	143	345	[e]850	481	25	293	51	136
1963 ...	2,196	299	299	522	147	375	[e]1,036	610	25	343	58	159

ransfers of funds expended annually for performance of basic research by sector, distributed by source, 1953–73 [a]

[Dollars in millions]

al nent	Industry [b]			Universities and colleges					Associated FFRDC's [c]		Other nonprofit institutions [b]			
Source		Sources			Sources					Source		Sources		
Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions [d]
101	151	[e]19	[e]132	[e]173	73	12	73	15	33	33	31	8	4	19
102	[e]166	23	143	206	90	14	85	17	39	39	[e]35	11	4	20
90	[e]189	27	162	[e]237	103	16	99	19	49	49	[e]43	17	5	21
104	253	[e]37	[e]216	[e]286	130	18	116	22	51	51	[e]53	23	5	25
122	271	[e]41	[e]230	[e]337	155	21	136	25	65	65	62	25	5	32
126	295	[e]43	[e]252	390	178	24	159	29	78	78	[e]84	35	6	43
173	320	[e]72	[e]248	[e]468	226	24	185	33	92	92	[e]102	46	8	48
160	376	[e]79	[e]297	[e]576	299	24	215	38	97	97	[e]117	58	10	49
206	395	[e]81	[e]314	[e]701	382	25	250	44	115	115	[e]126	57	11	58
251	488	143	345	[e]850	481	25	293	51	136	136	[e]161	80	12	69
299	522	147	375	[e]1,036	610	25	343	58	159	159	[e]180	95	14	71

Table B–2. Transfers of funds expended annually for performance of basic research by sector, distributed by sou

[Dollars in millions]

Year	Total basic research	Federal Government		Industry [b]			Universities and colleges					Associated FFRDC's [c]	
			Source		Sources			Sources					So
		Total funds used	Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Fede Gove me
1964 ...	2,559	364	364	549	165	384	1,261	767	25	402	67	191	19
1965 ...	2,853	424	424	592	186	406	[e]1,419	879	26	445	69	208	20
1966 ...	3,123	445	445	624	173	451	1,601	1,009	27	494	71	227	22
1967 ...	3,357	472	472	629	202	427	[e]1,785	1,124	31	551	79	250	25
1968 ...	3,648	502	502	642	180	462	2,011	1,268	36	621	86	276	27
1969 ...	3,758	565	565	618	160	458	[e]2,087	1,275	39	678	95	275	27
1970 ...	3,934	646	646	629	158	471	2,185	1,288	40	747	110	269	26
1971 ... (prel.)	4,010	535	535	625	131	494	[e]2,365	1,349	46	851	119	260	26
1972 ... (est.)	4,310	578	578	660	140	520	2,542	1,409	51	954	128	285	28
1973... (est.)	4,480	590	590	705	145	560	2,615	1,420	53	1,013	129	300	30

[a] All data are based on reports by performers.

[b] Expenditures for Federally Funded Research and Development Centers administered by both industry and by nonprofit institutions are included in the totals of their respective sectors.

[c] FFRDC's administered by individual universities and colleges and by university-consortia.

[d] Includes State and local government funds.

[e] Estimates derived from related information becau this year or this item was not obtained in survey.

f funds expended annually for performance of basic research by sector, distributed by source, 1953–73 [a]—Cont.

[Dollars in millions]

urce	Industry [b]			Universities and colleges					Associated FFRDC's [c]		Other nonprofit institutions [b]			
		Sources			Sources					Source		Sources		
ral rn- nt	Total funds used	Federal Govern- ment	Industry [d]	Total funds used	Federal Govern- ment	Industry	Univer- sities and col- leges [d]	Other non- profit institu- tions	Total funds used	Federal Govern- ment	Total funds used	Federal Govern- ment	Industry	Other non- profit institu- tions [d]
4	549	165	384	1,261	767	25	402	67	191	191	194	108	15	71
4	592	186	406	e1,419	879	26	445	69	208	208	e210	120	16	74
5	624	173	451	1,601	1,009	27	494	71	227	227	e226	132	18	76
2	629	202	427	e1,785	1,124	31	551	79	250	250	e221	125	19	77
2	642	180	462	2,011	1,268	36	621	86	276	276	e217	118	20	79
5	618	160	458	e2,087	1,275	39	678	95	275	275	213	111	22	80
6	629	158	471	2,185	1,288	40	747	110	269	269	e205	100	25	80
5	625	131	494	e2,365	1,349	46	851	119	260	260	e225	115	25	85
8	660	140	520	2,542	1,409	51	954	128	285	285	245	130	25	90
0	705	145	560	2,615	1,420	53	1,013	129	300	300	270	145	30	95

and Development Centers administered by both industry
the totals of their respective sectors.
ties and colleges and by university-consortia.

[d] Includes State and local government funds.

e Estimates derived from related information because either no sector survey was conducted for this year or this item was not obtained in survey.

Table B–3. Transfers of funds expended annually for performance of applied research by sector, distribute

[Dollars in millions]

Year	Total applied research	Federal Government		Industry [b]			Universities and colleges					Associate FFRDC's	
			Source		Sources			Sources					
		Total funds used	Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Fe Go m
1953 ...	1,317	[e]345	345	[e]726	288	438	[e]146	57	6	73	10	44	
1954 ...	1,430	[e]349	349	[e]814	322	492	154	61	7	76	10	51	
1955 ...	1,525	[e]310	310	[e]928	368	560	[e]155	58	8	79	10	65	
1956 ...	1,938	[e]356	356	1,268	[e]474	[e]794	[e]169	68	9	81	11	71	
1957 ...	2,429	[e]417	417	1,670	[e]678	[e]992	[e]169	62	11	85	11	86	
1958 ...	2,757	[e]474	474	1,911	[e]774	[e]1,137	175	64	12	88	11	102	1
1959 ...	2,965	[e]558	558	1,991	[e]813	[e]1,178	[e]186	67	12	95	12	119	1
1960 ...	3,093	[e]595	595	2,029	[e]833	[e]1,196	[e]215	88	13	102	12	122	1
1961 ...	3,156	[e]634	634	1,977	[e]812	[e]1,165	[e]233	98	13	110	12	135	1
1962 ...	3,775	[e]702	702	2,449	1,011	1,438	[e]253	109	13	118	13	155	1
1963 ...	3,881	730	730	2,457	1,007	1,450	[e]283	128	14	128	13	170	1

fers of funds expended annually for performance of applied research by sector, distributed by source, 1953–73

[Dollars in millions]

nt	Industry [b]			Universities and colleges					Associated FFRDC's [c]		Other nonprofit institutions [b]			
ource		Sources			Sources					Source		Sources		
deral overn- ment	Total funds used	Federal Govern- ment	Industry [d]	Total funds used	Federal Govern- ment	Industry	Univer- sities and col- leges [d]	Other non- profit institu- tions	Total funds used	Federal Govern- ment	Total funds used	Federal Govern- ment	Industry	Other non- profit institu- tions [d]
345	[e]726	288	438	[e]146	57	6	73	10	44	44	56	36	11	9
349	[e]814	322	492	154	61	7	76	10	51	51	[e]62	39	13	10
310	[e]928	368	560	[e]155	58	8	79	10	65	65	[e]67	41	15	11
356	1,268	[e]474	[e]794	[e]169	68	9	81	11	71	71	[e]74	43	17	14
417	1,670	[e]678	[e]992	[e]169	62	11	85	11	86	86	87	49	17	21
474	1,911	[e]774	[e]1,137	175	64	12	88	11	102	102	[e]95	54	17	24
558	1,991	[e]813	[e]1,178	[e]186	67	12	95	12	119	119	[e]111	67	18	26
595	2,029	[e]833	[e]1,196	[e]215	88	13	102	12	122	122	[e]132	87	19	26
634	1,977	[e]812	[e]1,165	[e]233	98	13	110	12	135	135	[e]177	125	19	33
702	2,449	1,011	1,438	[e]253	109	13	118	13	155	155	[e]216	150	22	44
730	2,457	1,007	1,450	[e]283	128	14	128	13	170	170	[e]241	170	23	48

Table B–3. Transfers of funds expended annually for performance of applied research by sector, distributed by sou

[Dollars in millions]

Year	Total applied research	Federal Government		Industry [b]			Universities and colleges					Associated FFRDC's [c]	
			Source		Sources			Sources					Sourc
		Total funds used	Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Federal Govern- ment
1964 ...	4,300	928	928	2,600	1,040	1,560	294	127	14	139	14	202	202
1965 ...	4,537	1,030	1,030	2,658	1,038	1,620	[e]346	157	13	155	21	204	204
1966 ...	4,819	1,047	1,047	2,843	1,039	1,804	400	194	13	161	32	207	207
1967 ...	5,048	1,102	1,102	2,915	1,066	1,849	[e]454	222	15	182	35	219	219
1968 ...	5,444	1,204	1,204	3,124	1,043	2,081	492	241	16	198	37	231	231
1969 ...	5,628	1,201	1,201	3,287	1,015	2,272	[e]501	245	16	200	40	210	210
1970 ...	5,995	1,378	1,378	3,399	1,049	2,350	527	266	16	200	45	216	216
1971 ... (prel.)	6,157	1,477	1,477	3,388	977	2,411	[e]570	276	18	228	48	220	220
1972 ... (est.)	6,492	1,579	1,579	3,545	990	2,555	612	286	20	255	51	230	230
1973 ... (est.)	6,835	1,660	1,660	3,780	1,050	2,730	665	330	22	261	52	240	240

[a] All data are based on reports by performers.
[b] Expenditures for Federally Funded Research and Development Centers administered by both industry and by nonprofit institutions are included in the totals of their respective sectors.
[c] FFRDC's administered by individual universities and colleges and by university-consortia.
[d] Includes State and local government funds.
[e] Estimates derived from related information because this year or this item was not obtained in survey.

nds expended annually for performance of applied research by sector, distributed by source, 1953–73 [a]—Cont.

[Dollars in millions]

	Industry [b]			Universities and colleges					Associated FFRDC's [c]		Other nonprofit institutions [b]			
		Sources			Sources					Source		Sources		
	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions [d]
	2,600	1,040	1,560	294	127	14	139	14	202	202	276	206	22	48
	2,658	1,038	1,620	[e]346	157	13	155	21	204	204	[e]299	224	25	50
	2,843	1,039	1,804	400	194	13	161	32	207	207	[e]322	242	27	53
	2,915	1,066	1,849	[e]454	222	15	182	35	219	219	[e]358	265	31	62
	3,124	1,043	2,081	492	241	16	198	37	231	231	[e]393	288	35	70
	3,287	1,015	2,272	[e]501	245	16	200	40	210	210	429	311	39	79
	3,399	1,049	2,350	527	266	16	200	45	216	216	[e]475	350	40	85
	3,388	977	2,411	[e]570	276	18	228	48	220	220	[e]502	367	45	90
	3,545	990	2,555	612	286	20	255	51	230	230	526	386	50	90
	3,780	1,050	2,730	665	330	22	261	52	240	240	490	350	50	90

Development Centers administered by both industry
e totals of their respective sectors.
and colleges and by university-consortia.

[d] Includes State and local government funds.

[e] Estimates derived from related information because either no sector survey was conducted for this year or this item was not obtained in survey.

Table B–4. Transfers of funds expended annually for performance of development by sector, distributed by so

[Dollars in millions]

Year	Total development	Federal Government		Industry [b]			Universities and colleges					Associated FFRDC's [c]	
			Source		Sources			Sources					So
		Total funds used	Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Fede Gove me
1953 ...	3,401	e564	564	e2,753	1,123	1,630	e15	8	1	5	1	44	4
1954 ...	3,760	e569	569	e3,090	1,405	1,685	17	9	1	6	1	51	5
1955 ...	4,146	e505	505	e3,523	e1,785	e1,738	e17	8	1	7	1	66	6
1956 ...	5,798	e580	580	5,084	e2,817	e2,267	e25	15	2	7	1	72	7
1957 ...	6,626	e681	681	5,790	e3,616	e2,174	e25	12	2	9	2	89	8
1958 ...	7,140	e774	774	6,183	e3,942	e2,241	27	12	3	10	2	113	11
1959 ...	8,420	e909	909	7,307	e4,750	e2,557	e28	13	3	10	2	127	12
1960 ...	9,311	e971	971	8,104	e5,169	e2,935	e34	18	3	11	2	141	14
1961 ...	9,853	e1,034	1,034	8,536	e5,347	e3,189	e35	20	2	11	2	160	16
1962 ...	10,004	e1,145	1,145	8,527	5,281	3,246	e40	23	2	13	2	179	17
1963 ...	11,294	1,250	1,250	9,651	6,116	3,535	e40	22	2	14	2	201	20

ansfers of funds expended annually for performance of development by sector, distributed by source, 1953–73 [a]

[Dollars in millions]

ral ment	Industry [b]			Universities and colleges					Associated FFRDC's [c]		Other nonprofit institutions [b]			
Source		Sources			Sources					Source			Sources	
Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions [d]
564	e2,753	1,123	1,630	e15	8	1	5	1	44	44	25	16	5	4
569	e3,090	1,405	1,685	17	9	1	6	1	51	51	e33	17	8	8
505	e3,523	e1,785	e1,738	e17	8	1	7	1	66	66	e35	17	8	10
580	5,084	e2,817	e2,267	e25	15	2	7	1	72	72	e37	18	8	11
681	5,790	e3,616	e2,174	e25	12	2	9	2	89	89	41	21	8	12
774	6,183	e3,942	e2,241	27	12	3	10	2	113	113	e43	22	8	13
909	7,307	e4,750	e2,557	e28	13	3	10	2	127	127	e49	27	9	13
971	8,104	e5,169	e2,935	e34	18	3	11	2	141	141	e61	35	11	15
1,034	8,536	e5,347	e3,189	e35	20	2	11	2	160	160	e88	58	11	19
1,145	8,527	5,281	3,246	e40	23	2	13	2	179	179	e113	80	11	22
1,250	9,651	6,116	3,535	e40	22	2	14	2	201	201	e152	115	11	26

Table B–4. Transfers of funds expended annually for performance of development by sector, distributed by sourc

[Dollars in millions]

Year	Total development	Federal Government		Industry [b]			Universities and colleges					Associated FFRDC's [c]	
			Source		Sources			Sources					Source
		Total funds used	Federal Government	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Federal Government
1964 ...	12,355	1,546	1,546	10,363	6,515	3,848	40	22	2	14	2	236	236
1965 ...	13,049	1,639	1,639	10,935	6,516	4,419	[e]57	37	2	15	3	217	217
1966 ...	14,322	1,728	1,728	12,081	7,120	4,961	84	59	2	18	5	196	196
1967 ...	15,208	1,822	1,822	12,841	7,097	5,744	[e]90	63	2	20	5	204	204
1968 ...	16,027	1,787	1,787	13,663	7,337	6,326	96	63	3	22	8	212	212
1969 ...	16,793	1,735	1,735	14,413	7,276	7,137	[e]117	80	5	22	10	240	240
1970 ...	16,637	1,829	1,829	14,034	6,572	7,462	144	104	6	23	11	252	252
1971 ... (prel.)	17,148	2,141	2,141	14,301	6,563	7,738	[e]135	99	6	20	10	236	236
1972 ... (est.)	18,348	2,323	2,323	15,335	7,015	8,320	126	93	6	17	10	254	254
1973 ... (est.)	18,785	2,250	2,250	15,815	6,905	8,910	145	110	8	16	11	260	260

[a] All data are based on reports by performers.

[b] Expenditures for Federally Funded Research and Development Centers administered by both industry and by nonprofit institutions are included in the totals of their respective sectors.

[c] FFRDC's administered by individual universities and colleges and by university-consortia.

[d] Includes State and local government funds.

[e] Estimates derived from related information because this year or this item was not obtained in survey.

f funds expended annually for performance of development by sector, distributed by source, 1953–73 [a]—Cont.

[Dollars in millions]

	Industry [b]			Universities and colleges					Associated FFRDC's [c]		Other nonprofit institutions [b]			
e		Sources			Sources					Source		Sources		
al n-	Total funds used	Federal Government	Industry [d]	Total funds used	Federal Government	Industry	Universities and colleges [d]	Other nonprofit institutions	Total funds used	Federal Government	Total funds used	Federal Government	Industry	Other nonprofit institutions [d]
	10,363	6,515	3,848	40	22	2	14	2	236	236	170	136	10	24
	10,935	6,516	4,419	[e]57	37	2	15	3	217	217	[e]201	154	12	35
3	12,081	7,120	4,961	84	59	2	18	5	196	196	[e]233	172	14	47
	12,841	7,097	5,744	[e]90	63	2	20	5	204	204	[e]251	187	16	48
	13,663	7,337	6,326	96	63	3	22	8	212	212	[e]269	202	18	49
	14,413	7,276	7,137	[e]117	80	5	22	10	240	240	288	218	20	50
	14,034	6,572	7,462	144	104	6	23	11	252	252	[e]378	298	25	55
	14,301	6,563	7,738	[e]135	99	6	20	10	236	236	[e]335	250	30	55
3	15,335	7,015	8,320	126	93	6	17	10	254	254	310	225	30	55
0	15,815	6,905	8,910	145	110	8	16	11	260	260	315	230	30	55

d Development Centers administered by both industry
he totals of their respective sectors.
s and colleges and by university-consortia.

[d] Includes State and local government funds.

[e] Estimates derived from related information because either no sector survey was conducted for this year or this item was not obtained in survey.

Table B–5. Sources of funds, by sector, used for research and development, 1953–73 [a]

[Dollars in millions]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	5,207	2,759	2,239	151	58
1954	5,738	3,138	2,367	167	66
1955	6,279	3,509	2,513	185	72
1956	8,483	4,859	3,336	204	84
1957	9,912	6,119	3,460	230	103
1958	10,870	6,791	3,700	257	122
1959	12,540	8,059	4,057	290	134
1960	13,730	8,752	4,508	328	142
1961	14,552	9,264	4,749	371	168
1962	15,665	9,926	5,114	424	201
1963	17,371	11,219	5,449	485	218
1964	19,214	12,553	5,880	555	226
1965	20,439	13,033	6,539	615	252
1966	22,264	13,990	7,317	673	284
1967	23,613	14,420	8,134	753	306
1968	25,119	14,952	8,997	841	329
1969	26,179	14,917	10,008	900	354
1970	26,566	14,775	10,435	970	386
1971 (prel.)	27,315	14,996	10,813	1,099	407
1972 (est.)	29,150	15,923	11,577	1,226	424
1973 (est.)	30,100	15,985	12,393	1,290	432

[a] Summary of R&D data in table B–1, by source.

Source: National Science Foundation.

Table B–6. Sources of funds, by secto

[Dollars in

Year	Total	Feder Governm
1953	489	23
1954	548	26
1955	608	28
1956	747	34
1957	857	40
1958	973	46
1959	1,155	60
1960	1,326	69
1961	1,543	84
1962	1,886	1,09
1963	2,196	1,31
1964	2,559	1,59
1965	2,853	1,81
1966	3,123	1,98
1967	3,357	2,17
1968	3,648	2,34
1969	3,758	2,38
1970	3,934	2,46
1971 (prel.)	4,010	2,39
1972 (est.)	4,310	2,54
1973 (est.)	4,480	2,60

[a] Summary of basic research data in table B–2, by so

Source: National Science Foundation.

or, used for research and development, 3–73 [a]

in millions]

eral nment	Industry	Universities and colleges	Other nonprofit institutions
59	2,239	151	58
38	2,367	167	66
09	2,513	185	72
59	3,336	204	84
19	3,460	230	103
91	3,700	257	122
59	4,057	290	134
52	4,508	328	142
64	4,749	371	168
26	5,114	424	201
19	5,449	485	218
53	5,880	555	226
33	6,539	615	252
90	7,317	673	284
20	8,134	753	306
52	8,997	841	329
17	10,008	900	354
75	10,435	970	386
96	10,813	1,099	407
23	11,577	1,226	424
85	12,393	1,290	432

Table B–6. Sources of funds, by sector, used for basic research, 1953–73 [a]

[Dollars in millions]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	489	234	148	73	34
1954	548	265	161	85	37
1955	608	286	183	99	40
1956	747	345	239	116	47
1957	857	408	256	136	57
1958	973	460	282	159	72
1959	1,155	609	280	185	81
1960	1,326	693	331	215	87
1961	1,543	841	350	250	102
1962	1,886	1,091	382	293	120
1963	2,196	1,310	414	343	129
1964	2,559	1,595	424	402	138
1965	2,853	1,817	448	445	143
1966	3,123	1,986	496	494	147
1967	3,357	2,173	477	551	156
1968	3,648	2,344	518	621	165
1969	3,758	2,386	519	678	175
1970	3,934	2,461	536	747	190
1971 (prel.)	4,010	2,390	565	851	204
1972 (est.)	4,310	2,542	596	954	218
1973 (est.)	4,480	2,600	643	1,013	224

[a] Summary of basic research data in table B–2, by source.

Source: National Science Foundation.

Table B–7. Sources of funds, by sector, used for applied research, 1953–73 [a]

[Dollars in millions]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	1,317	770	455	73	19
1954	1,430	822	512	76	20
1955	1,525	842	583	79	21
1956	1,938	1,012	820	81	25
1957	2,429	1,292	1,020	85	32
1958	2,757	1,468	1,166	88	35
1959	2,965	1,624	1,208	95	38
1960	3,093	1,725	1,228	102	38
1961	3,156	1,804	1,197	110	45
1962	3,775	2,127	1,473	118	57
1963	3,881	2,205	1,487	128	61
1964	4,300	2,503	1,596	139	62
1965	4,537	2,653	1,658	155	71
1966	4,819	2,729	1,844	161	85
1967	5,048	2,874	1,895	182	97
1968	5,444	3,007	2,132	198	107
1969	5,628	2,982	2,327	200	119
1970	5,995	3,259	2,406	200	130
1971 (prel.)	6,157	3,317	2,474	228	138
1972 (est.)	6,492	3,471	2,625	255	141
1973 (est.)	6,835	3,630	2,802	261	142

[a] Summary of applied research data in table B–3, by source.

Source: National Science Foundation.

Table B–8. Sources of funds, by sector,

[Dollars in m

Year	Total	Federal Governmen
1953	3,401	1,755
1954	3,760	2,051
1955	4,146	2,381
1956	5,798	3,502
1957	6,626	4,419
1958	7,140	4,863
1959	8,420	5,826
1960	9,311	6,334
1961	9,853	6,619
1962	10,004	6,708
1963	11,294	7,704
1964	12,355	8,455
1965	13,049	8,563
1966	14,322	9,275
1967	15,208	9,373
1968	16,027	9,601
1969	16,793	9,549
1970	16,637	9,055
1971 (prel.)	17,148	9,289
1972 (est.)	18,348	9,910
1973 (est.)	18,785	9,755

[a] Summary of development data in table B–4, by source.

Source: National Science Foundation.

used for applied research, 1953–73 [a]

millions]

ıl ent	Industry	Universities and colleges	Other nonprofit institutions
0	455	73	19
2	512	76	20
2	583	79	21
2	820	81	25
2	1,020	85	32
3	1,166	88	35
4	1,208	95	38
5	1,228	102	38
4	1,197	110	45
7	1,473	118	57
5	1,487	128	61
3	1,596	139	62
3	1,658	155	71
9	1,844	161	85
4	1,895	182	97
7	2,132	198	107
2	2,327	200	119
9	2,406	200	130
7	2,474	228	138
1	2,625	255	141
0	2,802	261	142

source.

Table B–8. Sources of funds, by sector, used for development, 1953–73 [a]

[Dollars in millions]

Year	Total	Federal Government	Industry	Universities and colleges	Other nonprofit institutions
1953	3,401	1,755	1,636	5	5
1954	3,760	2,051	1,694	6	9
1955	4,146	2,381	1,747	7	11
1956	5,798	3,502	2,277	7	12
1957	6,626	4,419	2,184	9	14
1958	7,140	4,863	2,252	10	15
1959	8,420	5,826	2,569	10	15
1960	9,311	6,334	2,949	11	17
1961	9,853	6,619	3,202	11	21
1962	10,004	6,708	3,259	13	24
1963	11,294	7,704	3,548	14	28
1964	12,355	8,455	3,860	14	26
1965	13,049	8,563	4,433	15	38
1966	14,322	9,275	4,977	18	52
1967	15,208	9,373	5,762	20	53
1968	16,027	9,601	6,347	22	57
1969	16,793	9,549	7,162	22	60
1970	16,637	9,055	7,493	23	66
1971 (prel.)	17,148	9,289	7,774	20	65
1972 (est.)	18,348	9,910	8,356	17	65
1973 (est.)	18,785	9,755	8,948	16	66

[a] Summary of development data in table B–4, by source.

Source: National Science Foundation.

Table B–9. Trends in defense, space,and all other R&D outlays, by source, 1953–73

Year	Defense-space outlays as a percent of total R&D			Nondefense-nonspace outlays as a percent of total R&D		
	Total	Defense related	Space related	Total	Non-Federal	Federal
1953	48.3	47.5	0.8	51.7	47.0	4.7
1954	49.1	48.2	0.9	50.9	45.3	5.6
1955	48.4	47.4	1.0	51.6	44.1	7.5
1956	49.5	48.6	0.9	50.5	42.7	7.8
1957	53.2	52.2	1.0	46.8	38.3	8.5
1958	53.0	52.0	1.0	47.0	37.5	9.5
1959	55.8	53.3	2.5	44.2	35.7	8.5
1960	54.7	51.6	3.1	45.3	36.3	9.0
1961	54.7	49.2	5.5	45.3	36.3	9.0
1962	53.7	47.0	6.7	46.3	36.7	9.6
1963	54.3	40.6	13.7	45.7	35.4	10.3
1964	54.6	36.1	18.5	45.4	34.7	10.7
1965	52.7	32.3	20.4	47.3	36.2	11.1
1966	51.0	32.0	19.0	49.0	37.1	11.9
1967	48.2	33.9	14.3	51.8	39.0	12.8
1968	47.0	33.9	13.1	53.0	40.5	12.5
1969	44.6	33.5	11.1	55.4	43.0	12.4
1970	42.3	31.6	10.7	57.7	44.4	13.3
1971 (prel.)	40.2	31.0	9.2	59.8	45.1	14.7
1972 (est.)	39.5	29.2	10.3	60.5	45.4	15.1
1973 (est.)	37.8	28.0	9.8	62.2	46.9	15.3

Source: National Science Foundation

Table B–10. Full-time-equivalent (FTE) scientists and engineers employed in research and development, by sector, selected years [a]

[In thousands]

Sector	1954	1958	1961	1965	1968	1969	1970	1971	1972[b]
Total	236.8	354.7	425.2	496.5	550.6	559.4	549.7	532.8	525.4
Federal Government [c]	37.4	46.1	50.6	64.2	68.3	70.3	69.5	68.5	68.0
Industry [d,e]	164.1	256.1	312.0	348.4	381.9	385.8	377.4	363.4	356.0
Universities and colleges, total	25.0	36.5	42.4	53.4	66.0	68.3	68.5	68.4	67.6
Scientists and engineers	20.3	29.2	33.6	40.4	49.0	50.4	50.3	49.8	49.2
Graduate students [f]	4.7	7.3	8.8	13.0	17.0	17.9	18.2	18.6	18.4
Associated FFRDC's, total	5.0	8.1	9.1	11.1	11.2	11.6	11.5	11.5	11.8
Scientists and engineers	4.9	7.9	8.8	10.7	10.7	11.1	11.0	11.0	11.4
Graduate students [f]	.1	.2	.3	.4	.4	.5	.5	.5	.4
Other nonprofit institutions [d]	5.3	7.9	11.1	19.4	23.2	23.4	22.5	21.0	22.0

[a] Number of full-time employees plus the FTE of part-time employees. Excludes scientists and engineers employed in State and local government agencies.

[b] Estimate.

[c] Includes both civilian and military service personnel and managers of R&D. Military R&D scientists and engineers in the Department of Defense were estimated at 7,000 in 1954, 8,400 in 1958, 9,200 in 1961, 12,000 in 1965, 13,000 in 1968, 14,000 in 1969 and 1970, 12,000 in 1971 and 10,700 in 1972.

[d] Includes professional R&D personnel employed at FFRDC's administered by organizations in the sector.

[e] Excludes social scientists.

[f] Numbers of FTE graduate students receiving stipends and engaged in R&D.

Note: These figures represent yearly averages and may differ from other data in the text which is based upon surveys reporting the employment in a single month of the year. Data in the text excludes historians, political scientists, and other social scientists.

Source: National Science Foundation.

Other Science Resources Publications

Title	NSF Number	Price
Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1971	73-300	$2.10
Science Resources Studies Highlights, "Changes in Graduate Programs in Science and Engineering, 1970-72 and 1972-74"	72-311	–
A Price Index for Deflation of Academic R&D Expenditures	72-310	$0.25
Science Resources Studies Highlights, "First-Year, Full-Time Graduate Science Enrollment Continues to Decline"	72-308	–
Science Resources Studies Highlights, "Total Scientific and Technical Personnel in Industry Remains Level, R&D Personnel Lower in 1970"	72-306	–
Science Resources Studies Highlights, "Undergraduate Enrollments in Science and Engineering"	71-42	–